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The American Journal of Roentgenology

Edited by P. M. Hickey, M. D.
Associate Editor, F. C. Zapffe, M. D.

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THE AMERICAN JOURNAL OF ROENTGENOLOGY

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VOL. II MAY, 1915 No. 7

ROENTGEN SIGNS OF GASTRO-JEJUNAL ULCER—SOME SUGGESTIONS AS TO TECHNIQUE OF EXAMINATION—REPORT OF TWO CASES*

By RUSSELL D. CARMAN, M.D., Mayo Clinic, Rochester, Minn.

In a recent paper[1] Balfour and I reported thirteen cases of gastro-jejunal ulcer from the records of the Mayo Clinic. In each of these cases the original lesion for which the gastroenterostomy had been performed was duodenal ulcer. Paterson[2] in his 52 collected cases of jejunal and gastro-jejunal ulcer includes two gastro-jejunal in which the primary lesion was a gastric ulcer, and one (jejunal) following resection and gastroenterostomy for cancer of the stomach. An important etiologic factor appears to be the use of a continuous suture of unabsorbable material in making the anastomosis, silk or linen sutures being found at the site of the ulcer in many instances. However, these ulcers have also occurred after the use of the Murphy button. Pathologically, they are usually of considerable size, with much induration and hyperemia. The line of anastomosis is involved, but the ulcer tends, usually, to spread further on the jejunal than on the gastric side. (Fig. 1). Adhesions were present in the majority of our cases. Clinically, they do not manifest any symptoms or signs which can be considered definitely diagnostic. After a variable period of relief by the gastroenterostomy, the patient again develops pain and other symptoms, often somewhat like those prior to operation, but without any fixed and decisive complex. Any means which offers aid to the discovery of these ulcers is, therefore, of distinct value. My recent experience convinces me that by the Roentgen ray we can obtain such aid, and that in most instances the condition can be positively diagnosed. Jejunal ulcers, perforating into the colon, have been given passing mention in Roentgenologic literature, but simple gastro-jejunal ulcers have not heretofore been extensively studied from the Roentgen viewpoint.

Mathieu and Savignac[3] state that in jejunal ulcer perforating into the large bowel the direct passage of bismuth into the colon can be demonstrated. Moynihan and Tatlow's[4] case of gastro-jejunal ulcer was rayed by Rowden, but his report was non-committal. Barsony[5] reports a case of gastro-jejunal ulcer in which the Roentgen ray showed a pocket at the line of anastomosis, the size of a kroner. Some five hours later the pocket was still filled with bismuth after the stomach was empty. Barsony lays strong emphasis on the persistence of bismuth in the ulcer cavity as being characteristic. But, excepting one of the cases hereinafter reported, I have not noted any Roentgenologic evidence of a cavity resembling the niche of penetrating gastric ulcer or the accessory pocket of perforating ulcer. The statement in our original paper that "the nature of the ulcer rather precludes any probability of visualizing its crater as a niche" still holds good in all the cases I have seen, for the reason that the ulcer is most often

*Submitted for publication July 16, 1915.

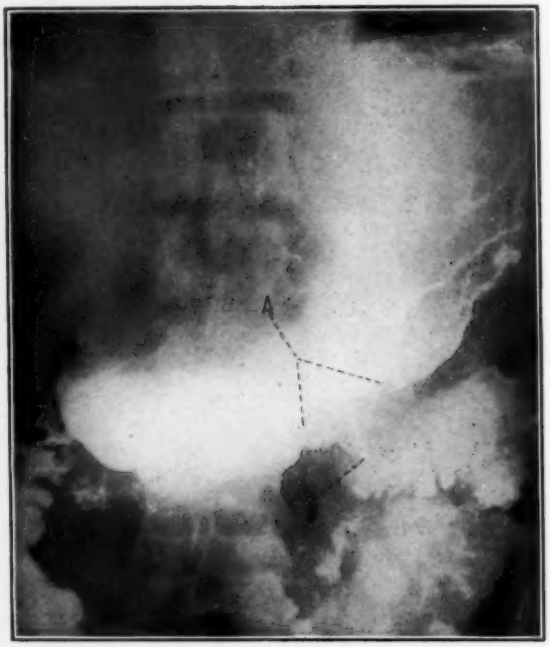

FIG. 1. Note deformity of greater curvature at stoma, a, and narrowing of efferent limb of jejunum at b. This roentgenogram shows how the ulcer involves both stomach and jejunum.

characterized by surface area rather than depth, like many of the saddle-ulcers of the lesser curvature. Eleven of the thirteen cases in our clinic examined by the Roentgen ray were all of the non-fistulous type, and all but two showed signs of secondary pathology. These manifestations included deformity about the stoma, narrowing and deformity of the jejunum, diminished patency of the stoma, dilatation of the stomach, retention from the six-hour meal, hyperperistalsis, dilatation of the duodenum, and spasticity of the stomach. All of these Roentgenologic phenomena are in consonance with the pathology of the condition as found at operation.

The elicitation of these signs I have found to be favored by certain technical minutiae, the details of which may be of service to others engaged in this work. As to the opaque salt, whether barium or bismuth, the vehicle, whether fermented milk, potato-starch-pap, etc., the proportions of the mixture and the total quantity given each examiner has his preference. These matters are of importance only as affecting the functional behavior of the stomach, and it is merely necessary that comparisons be made always upon that basis with which the examiner is familiar. One part of the routine which I insist upon for my own examinations is the employment of a six-hour meal[6] as a test of gastric motility. This meal consists of four ounces of cooked breakfast cereal mixed with two ounces of barium sulphate, and a little sugar and milk is permitted to be added if desired. It is given on a fasting stomach and the patient is required to abstain from food until the examination, six hours later. During the screen examination, two ounces of barium sulphate in eight ounces of water is given, followed by about three ounces of barium sulphate in twelve ounces of potato-starch-pap.

In every examination of the digestive tract, both Roentgenoscopy and Roentgenography should be employed. They should not be regarded as independent competitive

FIG. 2. Large stomach with deformity of stoma at a. Narrowing of jejunum at b. Note hyperperistalsis; peristaltic waves at c.

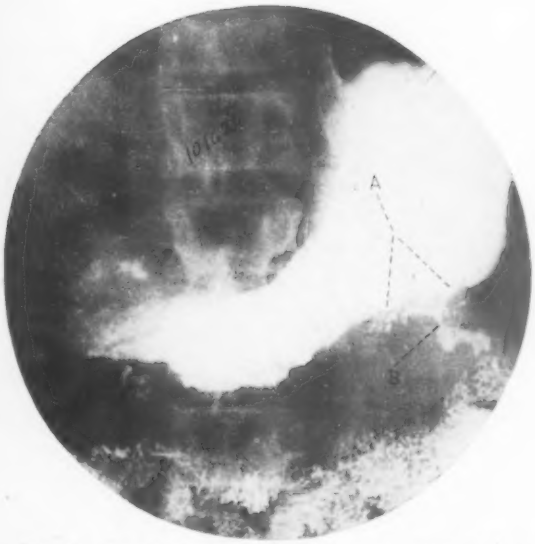

FIG. 3. Small stomach showing some spasm along the greater curvature. Irregularity of stoma, a, not well shown; this was seen to better advantage on the screen. Narrowing of the jejunum at b.

methods but as complementary parts of one method, for exclusive reliance upon either alone is likely to result in overlooking some important feature of a case. Roentgenoscopy is particularly necessary in examinations for gastro-jejunal ulcer.

Deformity about the stoma in cases of posterior gastroenterostomy is often not readily visible. If the point of anastomosis is well up on the vertical position of the stomach, an oblique view may show it, but it is much more commonly on the horizontal portion of the stomach. Here an oblique view is of little service, and I have often found it advantageous to lift up the overhanging lower border of the stomach by palpation and thus expose the anastomosis. While the point of attachment normally shows a little dimpling of the greater curvature, it is not markedly irregular. On the other hand, in many cases of gastro-jejunal ulcer I have noted rather striking deformity about the stoma. (Fig. 2). In cases of high anterior or posterior gastroenterostomy the lateral view may be of value. Gastro-jejunal ulcer following an anterior gastroenterostomy frequently produces a palpable mass which corresponds to the visible irregularity and filling defect about the stoma. This finding, I believe, is almost pathognomonic. Since the gastroenterostomy is often in the median line, pressure against the spine may deform this region and the examiner should be careful in his interpretation of plate findings. In making plates with the patient standing, he should be cautioned not to press the abdomen too tightly against the cassette. In the prone position his chest and hips should be supported by cushions, or a table with a deep fenestrum for the plate should be used. However, if the distortion about the stoma is sufficiently marked and identical on all plates, the observer may feel safe in saying that it is abnormal.

Narrowing and deformity of the jejunum was observed in nearly half the cases of gastro-jejunal ulcer. It involved the efferent limb near the stoma. (Fig. 3). This, also, should be definite and constant at the screen inspection and on all plates.

The signs of diminished patency of the stoma are both direct and indirect. Directly, the examiner can note the lessened amount of barium passing out, in contrast to the normal copious exit. If the flow is

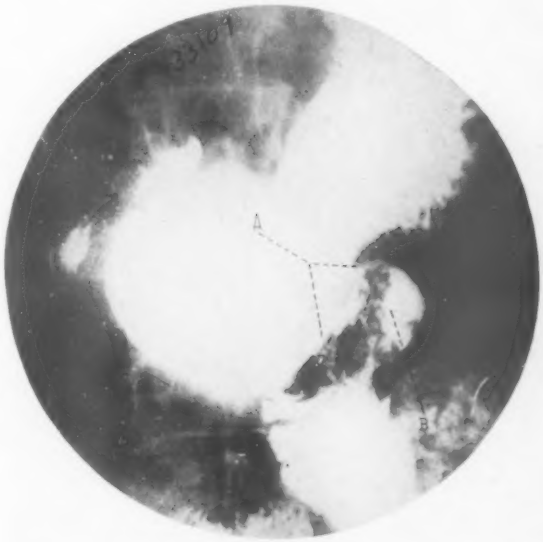

FIG. 4. Stomach of average size. Small six-hour residue about stoma. Marked deformity of stoma and efferent jejunum, a. Pocketing of jejunum at b. Stomach not freely mobile. Peristalsis normal. Pylorus moderately patent.

FIG. 5. Rather small stomach. Filling defect pars media, greater curvature about stoma at a. Irregularity and pocketing of jejunum, due mostly to adhesions, at b. No six-hour retention.

scant or wanting in spite of manual pressure of the gastric contents toward the stoma, it is reasonably certain that the opening is not free. While this finding is strongly indicative of gastro-jejunal ulcer, it is not absolutely so, since I have recently noted a case in which narrowing was found at operation but without any evidence of ulcer. However, in this instance there was no deformity of the stoma itself, a sign which is really necessary for diagnosis. Indirectly, obstruction may be manifested by a retention from the six-hour meal, or by the large size of the stomach. Hyperperistalsis or dilatation of the duodenum and afferent limb of the jejunum may also be in evidence. Of these signs, the six-hour retention is most important. Occurring in a gastroenterostomized stomach, it is highly significant of obstructed drainage. In most of the cases of retention in association with gastro-jejunal ulcer, the residue was between the stoma and pylorus. In one case, the barium rest was in the immediate neighborhood of the stoma, as though held in a small pouch. This proved to be a gross ulcer with a pocket of considerable size in the jejunum, being exaggerated by adhesions. The usual gastroenterostomized stomach, even though large before operation, tends to contract to normal or even smaller dimensions. If, then, it does not show diminution in size, but is still large, interference with its emptying may be suspected. Another common sequence of obstruction is an exaggeration of peristalsis. An increase in the vigor and number of the waves may also result from other causes, so that this sign is merely indicative of some abnormal condition. Dilatation of the duodenum was observed in one of our eleven cases, and this may or may not have been due to obstruction in the vicinity of the stoma.

Lessened mobility of the stomach was noted in two instances, and was the result of extensive adhesions about the stoma. But this is a sign of which the observer can rarely be certain, especially when dealing with a posterior gastroenterostomy. By palpation, changing the position of the patient and requiring him to breathe deeply, fixation at the point of anastomosis can sometimes be fairly determined.

Spasticity of the stomach, as seen in one case, cannot be considered very significant except as a minor indication of reflex irritation.

In translating the observation of these signs into a diagnostic opinion the examiner should be fully acquainted with the entire history of the case, the nature of the primary lesion, and the character and extent of surgical intervention. The Roentgen phenomena fall into two groups: those broadly denoting an abnormal condition, and those pointing directly to the seat of trouble. Six-hour retention, hyperperistalsis, large size of the stomach, dilatation of the duodenum and spasticity of the stomach are included in the first group. They may be noted singly or in varying combinations. The second group, namely, deformity about the stoma, narrowing of the jejunum, scant flow of barium through the gastroenterostomy opening, and fixation of the stomach at the site of anastomosis, all point to the latter as the pathologic focus, and here gastro-jejunal ulcer is by far the most common active lesion. In a

stomach resected for cancer, similar signs might result from a recurrence of the growth at the point of gastroenterostomy. The history should make distinction easy.

Since the publication of the paper referred to, two other cases of gastrojejunal ulcer have come under observation. The histories are as follows:

CASE 33109. Man, aged 53. Posterior gastroenterostomy was done in our clinic five and one-half years ago (Jan. 18, 1910) for duodenal ulcer. Last winter there was a recurrence of the old ulcer symptoms with distress three or four hours p. c. and food relief. This continued until eight weeks ago, at which time he took a purgative. This was followed by sudden abdominal cramps, not relieved until the bowels were moved by an enema. Since then he has vomited often, usually three or four hours after meals, occasionally vomiting food taken twenty-four hours previously. Loss of weight, 36 pounds. Total acids 28; free HCL 20; combined 8; no food remnants.

ROENTGEN FINDINGS: Stomach of average size. Small six-hour retention about stoma, which was moderately patent. Marked deformity of stoma and jejunum (Fig. 4) especially well seen during screen examination. Stomach not freely mobile. Nothing unusual about the peristalsis. Pylorus moderately patent. Diagnosis: Gastrojejunal ulcer.

OPERATION: June 16, 1915. There was a very large gastrojejunal ulcer involving both stomach and jejunum, forming a considerable pocket on the jejunal side, as the result of adhesions. The pyloric portion of stomach was adherent to the abdominal wall. The ulcer was excised, gastroenterostomy cut off, and a gastroduodenostomy done. Retained silk sutures were found in the ulcer. Microscopic examination of the tissue removed showed no evidence of malignancy.

CASE 112375. Man, aged 43, a physician. The patient was operated on in January, 1914, (elsewhere) for duodenal ulcer; excision of ulcer; pylorus closed; gastroenterostomy; appendectomy. When seen in this clinic August 7, 1914, he stated that about two months after the operation, feeling abdominal discomfort, he took a seidlitz powder which caused cramps in the lower abdomen. He has had similar attacks at intervals since. At this date his chief complaint is of an almost constant dragging pain across lower abdomen, more marked when distended and relieved somewhat by the passage of gas and by lying down. Loss of weight twenty pounds; none recently. In October, 1914, he was reoperated upon by the surgeon who performed the first operation. Adhesions were found about the stomach and a mass at the gastrojejunal junction with a linen thread hanging from it. He returned to the clinic July 5, 1915. He states that one week after the second operation an abscess developed in the wound and broke later, discharging copiously. The suppuration has recurred from time to time, and on several occasions linen thread was taken out. Since the operation he has had steady, hard, aching pain, relieved for an hour or two by a hearty meal. During the past week the pain has become so severe that morphine is required. One month ago he discovered a mass over the stomach. Physical examination showed separation of muscles and ventral hernia. Small scar of sinus, and tender movable mass the size of a walnut beneath this. (As shown at operation this mass was due to inflammatory thickening.)

ROENTGEN EXAMINATION: No retention. Filling defect (deformity) about stoma and jejunum. (Fig. 5.)

DIAGNOSIS: Possible gastrojejunal ulcer; possible adhesions or both. (While the Roentgen findings were typical for gastrojejunal ulcer the diagnosis was also quite evident from the clinical history.)

OPERATION JULY 13, 1915. FINDINGS: Gastrojejunal ulcer, in which was hanging a piece of linen thread eight inches long. The ulcer was an inch and a quarter in length by three quarters of an inch broad, was situated on the right anterior wall, involved three-eighths of the circumference of the stoma, and had perforated against the wall of the transverse colon without per-

forating into the lumen of the colon and without accessory-pocket formation. Sinuses communicating with abdominal wall. Ulcer excised; plastic repair; gastroenterostomy.

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ON THE MONOOSTEITIC FORM OF PAGET'S DISEASE OF BONE*

By S. H. HURWITZ, M. D., and G. L. CARR, M. D.

(From the Surgical Clinic, The Peter Bent Brigham Hospital, Boston.)

In a recent paper (1) one of us reported a case belonging to the monoösteitic form of osteitis deformans. The patient was a man, aged fifty-six years, in whom the malady, notwithstanding its existence for more than four years, remained localized in the right femur.

This type of Paget's disease has received little mention in foreign medical literature, and almost no reference to it can be found among American medical writings. It would appear that, either this form of the affection is rare, or what is more likely, that it has been confounded with syphilitic lesions of bone which may at times so closely simulate the localized form of Paget's disease that the differentiation can be made only by careful roentgenological study.

Lately our interest was directed again to this type of the disease by a patient who presented herself for treatment at the Out-Door Clinic of the Peter Bent Brigham Hospital. A complete roentgenological study of the whole skeleton disclosed the characteristic changes of osteitis deformans in the right tibia alone, although some questionable change was also made out in the lower portion of the right radius. Both for the reasons stated and because of the unmistakable nature of the morbid process we are prompted to put this case on record.

CASE (Disp. No. 15478). Oct. 21, 1914. —M. B., female, white, aged sixty-eight years.

COMPLAINT.—Pain in the right leg.

FAMILY HISTORY.—Both parents had lived to old age: her father died of a "shock" at the age of sixty-six years; her mother died aged seventy-six. Neither parent showed signs or symptoms of an affection similar to that of the patient. Of seven brothers and sisters, four were living and well. There was no history of rheumatism or gout among the members of her family.

PERSONAL HISTORY.—Aside from scarlet fever at the age of eight years she gave no history of infectious fevers or other ailments referable to the cardio-respiratory,

FIG. 1. View of lower extremities showing marked anterior bowing and massiveness of the right tibia.

*Presented at a Medical Meeting, The Peter Bent Brigham Hospital, December 22, 1914.

FIG. 2. Roentgenogram of bones of the right forearm; the right radius shows slight thickening of its cortex, especially in its distal one-third.

gastro-intestinal, or genito-urinary systems. There was no history of trauma nor were there any indications of syphilis in her past history. For five years previous she had suffered with "neuralgic" headaches.

PRESENT ILLNESS.—For the past two or three years she had suffered pain below the right knee, in the calf of the leg and along the right shin. The onset was so insidious that it was difficult for her to state with any certainty just when the discomfort in her leg first began. In the sitting posture she often felt pain below her right knee, caused by the pressure of the edge of the chair. The pain was especially severe on sudden movements, on extension of the leg and on sudden changes from the sitting to the standing posture. She had not had any marked pain on walking, although she limped somewhat and tended to favor her sound leg. The pain presented no constant characteristics and was usually absent during the night.

For several years before the onset of the symptoms mentioned she noticed that her leg was becoming bowed and misshapen, but she gave little heed to it until about one year ago when her daughter insisted that she seek medical advice.

She was aware of no other changes in her body. Her head had not changed in size. Her average height at the age of forty years, she believes, was about 5 ft. 2 in.

PHYSICAL EXAMINATION.—For her age she was exceptionally alert physically and mentally. Aside from the short stature and slight limping gait, she showed nothing striking on a general inspection; her height was 142.5 cm. (4 ft. 8 in.) and her weight 50.7 kilo. (127 lbs.).

SKELETAL SYSTEM.—The patient's general posture was not the characteristic one usually seen in the generalized form of this disease. The moderate stooping was well in keeping with her age, and this explained also the apparently undue length of the arms. The size of the head was not out of proportion to that of the body; neither the calvarium nor the features were prominent. Measurements of the head departed little from similar ones obtained from supposedly normal women beyond middle age.

THORAX.—The thorax was barrel-shaped; its circumference at the top of the axilla measured 77 cm. At the lower dorsal level there was a fairly well-marked kyphosis. The clavicles were not out of proportion to the rest of the bony frame-work of the chest, nor did they show any abnormal nodes at any point.

PELVIS.—The bony pelvis was neither broader nor heavier than normal; the distance between the lower border of the ribs

and the iliac crests was not decreased. Measurements of the pelvis showed the following: intercrestal diameter 27 cm., interspinous diameter 25 cm., and intertrochanteric diameter 31.5 cm.

UPPER EXTREMITIES.—The right radius showed a moderate thickening of its middle and lower third. The remaining bones of this extremity and those of the left arm were normal to palpation. The patient had some difficulty in completely extending the right forearm. The grand expansion of the arms measured 146.5 cm. (57.5 in.).

LOWER EXTREMITIES.—The right leg presented the special point of interest (Fig. 1): In the standing posture and with the internal malleoli in apposition, the right knee projected about 3 cm. beyond the left; this was due to the marked anterior and outward bowing of the right tibia, and moderate flexion of the right knee. With the heels together, the knees, as measured between the internal condyles of the femora, were 3 cm. apart. The right tibia was diffusely thickened and strikingly more massive to palpation. The circumference of the right leg at a distance of 12 cm. below the mid-patellar region was 3 cm. more on the right than on the left; and above the ankles this difference was about 1.5 cm. in favor of the right leg. Over the crest of the right tibia the skin was glossy, and on palpation irregular elevations of new-formed bone could be felt, slight pressure eliciting considerable tenderness.

There was definite shortening of the right lower extremity as a result of bowing of the right tibia. Accordingly, the pelvis was tilted slightly to the right.

MEASUREMENTS OF THE LOWER EXTREMITIES

	Cm. Right	Left
Anterior superior spine to internal malleolus	71.0	73.5
Umbilicus to internal malleolus	81.0	84.0
Ant. superior spine to int. condyle of femur	37.5	38.0

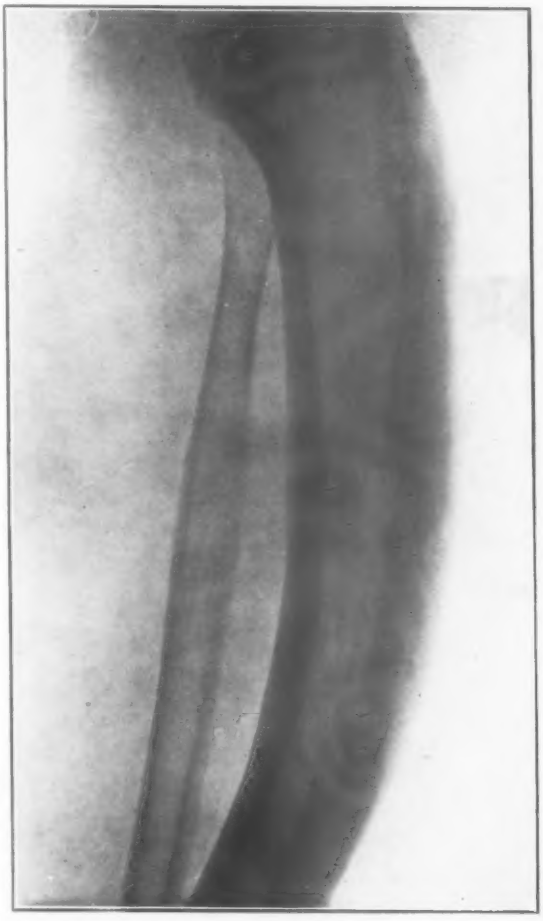

FIG. 3. Roentgenogram of right tibia and fibula; the right tibia is strikingly bowed anteriorly and shows marked thickening of its cortex, narrowing of the medullary canal, the cortex coarsely striated and areas of rarefaction throughout the entire length of the bone. The right fibula shows no pathological bony changes.

From the above measurements it was evident that the shortening of the right leg was about 2.5 cm., and that this was not due to shortening of the right femur. The difference, therefore, was to be accounted for only by the curvature and shortening of the right tibia.

HEIGHT.—The grand expansion of the arms was 146.5 cm. which was only 4 cm. more than her measured height. It would, therefore, seem unlikely that there had been much change in height.

FIG. 4. Roentgenogram of left tibia and fibula shows the absence of any bony changes in the corresponding bones of the left lower extremity.

GENERAL EXAMINATION.—Considering her age the outward signs of senility were not pronounced, a moderate arcus senilis, visible, but only slightly tortuous temporals, palpable but not markedly thickened radial arteries. The blood pressure, however, was considerably raised: systolic 180 mm. Hg. and diastolic 120 mm. Hg. The cardiac dulness was not increased and no murmurs were heard. Excepting for a moderate grade of emphysema and a slight bronchitis the pulmonary examination was negative.

Although the Wasserman reaction of the blood was negative, the possibility that the condition might be luetic was nevertheless entertained and the patient was given antiluetic treatment. Potassium iodide and mercurial inunctions were given for more than a month without producing subjective or objective changes in her condition: the pain in the right leg continued as before and the irregularities over the right shin remained unaffected.

ROENTGENOLOGICAL EXAMINATION

SKULL.—Average thickness about 5 mm. The cortex showed no increase in size. The structure was normal. There were no signs of increased intercranial pressure. The sella was normal in size and shape. The antero-posterior diameter was about 13 mm. It was about 10 mm. deep. The dorsum and clinoid processes were distinct. The skull corresponded in every way to that of the normal for her age.

RIGHT SHOULDER.—The clavicle and scapula showed no bony changes. In the proximal third of the humerus there was a slight though definite accentuation of the bony trabeculae with a suggestion of a slight bowing of the shaft; these changes were not typical of a deforming osteitis. The cortex showed no thickening.

LEFT SHOULDER.—No bony changes were noted in the clavicle, scapula or humerus.

RIGHT FOREARM (FIG. 2.).—The right radius and ulna showed a definite increase in the widths of the shafts, the outlines being somewhat irregular and the cortex slightly thickened; this thickening was more marked in the distal one-third of the radius and extended downward towards the articular surface. There were, besides, two small areas suggesting an absorption of lime salts. These changes in the radius, though not absolutely diagnostic of a deforming osteitis, were, however, very suggestive.

SPINE.—No bony changes were seen in the thoracic or lumbar spine.

HIPS.—No bony changes were noted.

The relations between the shaft and neck of the femora were normal on the two sides.

FEMORA.—Neither right nor left femur showed any bony changes.

TIBIA AND FIBULA (RIGHT) (FIG. 3).—The right tibia showed a striking anterior bowing, marked thickening of the cortex (largest transverse diameter was 17 mm.), and narrowing of the medullary canal. The structure of the cortex was coarsely striated. There were many small areas of rarefaction throughout the entire length of the tibia, especially marked where the bowing was greatest. The right fibula showed no pathological bony changes.

TIBIA AND FIBULA (LEFT) (FIG. 4).—There were no bony changes in either the left tibia or fibula. (The largest transverse diameter of the tibia was 10 mm.)

SUMMARY.—The chief points in the history and physical examination of this patient which deserve mention were: First, the insidious onset at the age of about sixty-five years of bowing and thickening of the right tibia, and the characteristic association of this deformity with vague pains in the knee and leg; second, the remarkable localization of the malady, at least at the present time, in a single bone, although the disease had lasted for a period of more than three years; third, the presence in the roentgenograms of the bony changes which characterize the disease. Attention should be called, however, to the fact that a thorough roentgenological study showed also a slight thickening of the cortex of the lower third of the radius.

DISCUSSION

It is of interest that not long after Sir James Paget's (2) description of the generalized form of the malady a few case reports of the monoösteitic form appeared in English medical literature. The first of these was recorded by Bowlby (3) in the Transactions of the Pathological Society of London for 1883. This patient came to autopsy and a pathological study of the diseased bone established with considerable certainty the true nature of the morbid process. A short clinical note on another such

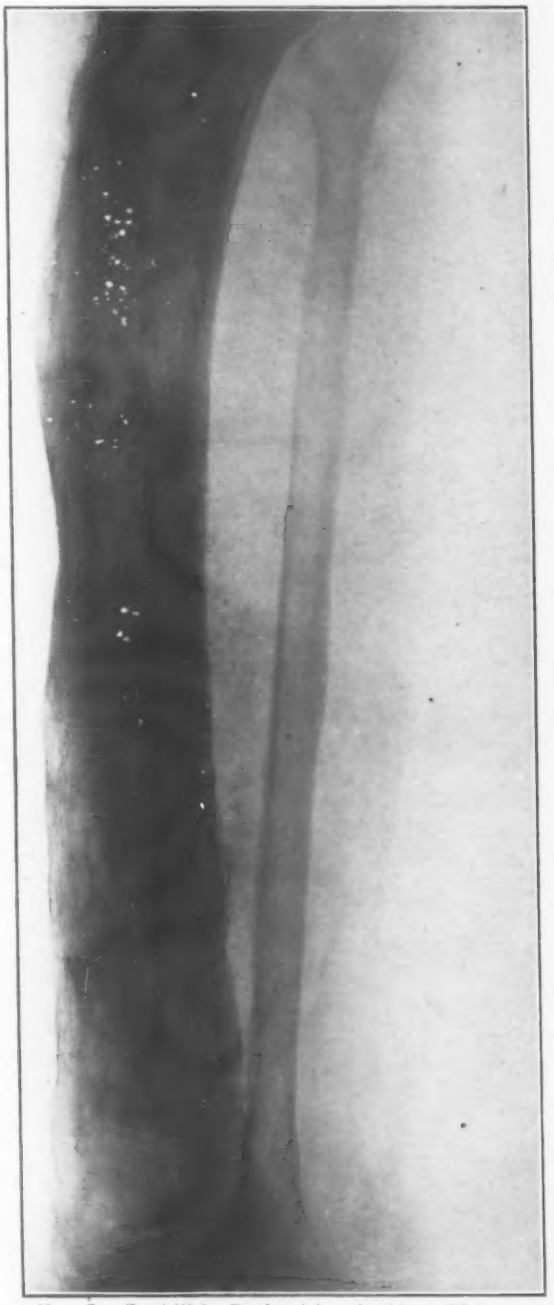

FIG. 5. Syphilitic Periostitis of tibia. The roentgenogram shows much coarse thickening of the shaft with irregular areas of sclerosis, due to the formation of sub-periosteal bone. The medulla is with difficulty differentiated from the cortex.

patient is given by Edmunds (4) in the London Illustrated Medical News for 1889, which contains a special number devoted to this disease. But no mention of such types of the affection by American writers is recorded in Schirmer's (5) complete bibliographic study of osteitis deformans up to 1908; nor were we able to find any such cases recorded in America since that time.

In the German medical journals, however, the monoösteitic form of Paget's disease has been mentioned and discussed, more especially within recent years. Of historical note in this connection is the fact that the name *osteitis deformans* was applied originally by Czerny (6) in 1873 to such a localized form of the disease, although it is not possible from the description to be certain that the malady in question was osteitis deformans.*

The more recent case records of Schmieden (7), Katholicky (8), and of Schlesinger (9), (10) are more valuable since they are accompanied by roentgenological studies of the whole skeleton which give the diagnosis greater certainty. Schlesinger, in particular, is inclined to place all of the localized forms of the malady into a special group which he designates the monoösteitic form of Paget's disease. This form he characterizes as follows: "The disease begins insidiously without trauma (without a history of lues), may continue for years without attracting the patient's attention, and is usually discovered accidentally. In all of the author's three cases the changes were well advanced before the disease was discovered by the physician. Pain appears to be absent; in this respect it differs from the types described by Joncheray, of which the painless form affects only the upper extremities. The power of walking is not greatly interfered with, even though the deformity of the tibia (thickening and bending) is far advanced. This point has been emphasized by Paget also. The disease affects the tibia, and as it appears, especially in front. It does not progress in spite of years' duration and apparently involves no other bones..... In all of the author's three cases the right tibia was affected**.

Certain points in the differential diagnosis between the localized form of osteitis deformans and other affections which may give rise to a similar clinical picture have been referred to in previous papers (1), (11). At this time we wish merely to emphasize again the points of difference between the monoösteitic type of Paget's disease of bone and syphilitic disease of bone, with which it is probably most often confounded.

As is well known, syphilitic periostitis with new bone formation is a frequent lesion, especially in congenital lues. In this condition the tibia is most commonly involved; the bone often curved and shows a rarefying and condensing osteitis, with irregular periosteal and endosteal new bone formation (Fig. 5). The condition may simulate so closely osteitis deformans that it has been designated osteitis deformans syphilitica.

The following points, however, may be of help in the clinical differentiation of the two conditions: First, in acquired syphilis the bones of the cranium are more frequently involved than the long bones; in congenital syphilis, where the long bones, especially the tibiae, are most frequently the seat of the disease, the patients are young, whereas osteitis deformans (Paget) usually affects patients late in life; second, in syphilitic disease lesions either of other bones or of the soft parts are likely to be present at the same time; in congenital syphilis other obvious signs of the disease may exist; third, the presence of osteocopic pain is an important feature of syphilitic disease of bone; the pain is worse at night, is usually continuous and has a boring character. In

*Concerning Czerny's case, Paget (Med. Chir. Tr., 1882, LXV, 225) says: "After the publication of the paper (Paget's first paper on osteitis deformans published in the Medical Chirurgical Transactions for 1877), it was found that the name osteitis deformans had been given by Prof. Czerny, of Freiburg, to a disease described by him in the 'Wiener Medicinische Wochenscrift,' September 27, 1873. It is namely, inflammation of the lower part of the tibia and fibula, inducing softening and angular bending, and then followed by hardening."

**Ref. 10, p. 101.

osteitis deformans the pain presents no constant characteristics; fourth, in most cases of syphilis of bone the effect of treatment is usually pronounced (improvement under treatment to be of diagnostic value, however, must be marked and sustained); fifth, careful study of the roentgenograms of syphilitic bone affections and of osteitis deformans has shown that the two diseases can be differentiated.*

CONCLUSIONS

The monoösteitic form of osteitis deformans is a rare but distinct disease entity. Although involvement of a single bone dominates the clinical picture, careful study may at times show suggestive changes in one or more of the other bones. It is, therefore, difficult to predict with any degree of certainty whether or not the disease will progressively involve other parts of the skeleton.

From syphilitic disease involving a single bone, osteitis deformans can be differentiated by the points mentioned.

We wish to thank Dr. F. G. Blake for the opportunity of studying the patient. To Dr. E. A. Locke of Boston we are indebted for his interest in examining the patient with us.

*Attention has been especia'ly directed to these differences by Kienböck (Zeitschr. f. Heilk.,—1902, XXIII, 130). It is worthy of mention that it was Kienböck who interpreted the Roentgenograms of Schlesinger's first case; whereas those of his second case were studied by Holzknecht.

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THE MASSIVE VERSUS THE FRACTIONAL DOSE IN ROENTGENTHERAPY

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Since it has been possible by means of the chemical pastil to accurately measure the Roentgen dose most Roentgenologists have eagerly adopted this improved method and the Massive dose has largely superseded the older method of the Fractional dose. That there have been good reasons for the adoption of the Massive dose no unprejudiced observer can deny. It has meant the placing of Roentgentherapy upon a scientific plane by which we may obtain the same accuracy and certainty as obtained in drug therapy. It means greater convenience and less expense to both patient and Roentgenologist. Instead of several treatments a week for a month or more by the Fractional dose method we may now administer a measured full dose at one sitting, to be repeated if necessary in three or four weeks. The superiority of the Massive dose from many phases cannot be questioned, but what of our results? In skin diseases, in deep therapy, in the entire field of Roentgentherapy, do we obtain the same curative effects from the Massive dose method in every case and in every condition as we have obtained, or may obtain, from the divided Fractional dose?

In my own experience with the Massive dose method I have had many successes which have seemed, in many cases, almost marvelous. I have also had some failures which have appeared most unusual and unaccountable. I have seen skin cancers disappear after one treatment and extensive rodent ulcers heal after a few Massive doses and in one-third the time required by the Fractional dose method. On the other hand I have failed and in some instances aggravated the lesions in cases of Psoriasis, Acne, Rosacea and Eczema. I shall briefly cite one case: Mr. K., age 30, came to me in February, 1914, with a generalized Psoriasis showing extension and marked lesions of the face. He had taken several courses of Roentgen treatment at different times of his home physician with the result each time of clearing his face of eruption for four to six months. He had been sent to me because his former physician had died. I advised Roentgentherapy as the quickest and surest method of treating his disfiguring lesions. He was a busy man and had come a good distance to consult me, consequently he was greatly pleased when I explained the Massive dose to him and he understood that only one or two treatments would be necessary. I gave him 4 H. units and told him to return in one week to let me observe the effect of the treatment. When he appeared at the time appointed there was noted a slight erythema, but the disease was markedly aggravated. I ascribed this to the irritation due to the Ray and concluded that it would pass away as the erythema subsided. I asked him to return in a month when I expected to find his skin clear. When he again returned the skin was not improved and the lesions were still aggravated. The patient was discouraged, but since the Ray had acted so efficiently when administered by his family physician he agreed to let me give him some Fractional doses twice a week. After five treatments the Psoriasis began to disappear and his skin soon appeared normal. So in eczema my results with the Massive dose have not been as successful as with the Fractional dose. In one case of Rosacea I made a complete failure. I have treated many cases of Rosacea with the Fractional dose with a complete and permanent cure in nearly every case. My technique in these cases is to treat twice a week until I obtain a moderate erythema. I then reduce the time of exposure but give

enough to maintain the erythema for several weeks. The prolonged effect will cause atrophy of the blood-vessels and the tissue hypertrophy and the chronic congestion disappear. I have never had any skin atrophy or other undesirable effects to follow. In my hands Rosacea, under Fractional doses of the Ray has seemed to yield even when caused by marked gastro-intestinal disturbance or alcohol; yet I know of no text-book on the skin that speaks encouragingly of the Roentgen treatment of this disfiguring ailment. I believe this is due to the fact that in the hands of the average Dermatologist, too little Ray is given. They use the same technique as in Acne Vulgaris and consequently they fail.

To generalize from my successes and failures with the Massive dose I would state that when we wish the stimulating effect of the Ray upon metabolism, as in Eczema, or the effect upon the skin appendages, such as in Rosacea or Acne Vulgaris, the Fractional dose method should be preferred. I would make an exception here in depilation where the Massive dose is to be preferred. When we want destruction of abnormal cells as in Epithelioma or deep effects on tissues such as Miomata, the Massive dose is more efficient, or, at least, more convenient. Here I would except such diseases as Leukaemia and Hodgkin's Disease, where the Massive dose may cause a toxaemia.

Such a generalization may not hold true in every case, but from my personal experience I do not believe we can entirely discard the fractional dose, especially in certain skin diseases. Why we should obtain different effects from the two methods I am unable to say. It is rather firmly established that certain drugs in some instances give better results when given in broken doses. May not the Ray show the same quality?

Another advantage of the Fractional dose about the face is the less danger of a severe dermatitis due to an idiosyncrasy to the Ray. I realize that many authorities do not believe in this idiosyncrasy, but I have felt very sure that I have had a few cases showing this undue susceptibility. We know we may have this undue susceptibility of the skin to the sun and some irritant drugs, and it is rational to suppose that we may have the same susceptibility in some patients to the Roentgen Ray.

To attain exactness the Fractional dose may be measured as well as the Massive dose. This method should be followed in certain cases, especially when the operator is not sure of his technique. For inexperienced Roentgenologists the Fractional dose certainly does not offer the possibilities of danger that accompanies the use of the Massive dose. When there is danger of toxaemia the measured Fractional dose should be used.

More Ray in the aggregate can be given with the Fractional dose. One may give 10 X, or its equivalent, with three millimeters of aluminum as a filter, once a week. In one month you have given 40 X. With the Massive dose it is not safe to exceed 20 to 30 X, which should not be repeated until the expiration of one month.

As for the Massive dose in conditions best adapted for its use, no one who has mastered its technique would willingly discard it for the older method. It has made possible all the recent advances in deep therapy. But its technique must be mastered to avoid the very serious dangers attending its use. The advent of the Coolidge tube has immensely increased the efficiency of the Massive dose method. With larger currents through the tube, shorter time of exposure and an evenly maintained "hard" Ray, deep Roentgentherapy presents great possibilities However, this wave of enthusiasm for deep therapy will, in the hands of inexperienced operators, bring in its wake some sad reports that will discredit the method to a critical profession. It is difficult to make the average physician see that it requires as much skill to successfully treat a uterine myomata with the Roentgen Ray as it does to remove it surgically. With the Massive dose one cannot feel his way, so to speak, to an erythema as with repeated small doses.

Personally, it is my custom to tabulate all the important factors of technique in every

Massive dose given. Every patient has his card with vertical column giving the date of treatment, time of exposure, the tube used, the amount of current through the tube, the distance of the tube, the qualimeter reading, amount of filter used and the number of dose units given. With such a record it is easy to increase or decrease the second treatment according to the results desired. With these factors recorded one is able to standardize their tubes and discard the pastils at subsequent treatments. I believe this is a perfectly safe procedure if the qualimeter reading of the tube does not vary. With the filter the time of treatment is usually three to five times as long as without a filter. With three millimeters of aluminum the erythema dose may be safely doubled. In general, with filters, the margin of safety is greatly extended, but severe burns may occur as without the filter. The vacuum of the tube is most important and a reliable qualimeter is most essential. The qualimeter and milliampere meter readings should be closely watched. The pastils may be relied upon if they are properly preserved.

Conclusions:

1. The Massive dose, which is accurate and convenient is not suitable for the treatment of all diseases amenable to Roentgentherapy. Its greatest field is in deep therapy and for destructive action on cancer cells.

2. The Fractional dose gives better results in skin diseases calling for stimulation and where you desire to produce atrophy of the skin appendages, also in such conditions as Leukaemia and Hodgkin's Disease. For safety it is the best method for the face.

3. The Fractional dose may be measured by means of any reliable scale.

4. With either method of Roentgentherapy, technique is the *sc qua non*. This is especially true with the Massive dose to avoid the great possibilities of danger.

5. The value of a record in Massive dose treatments is most important.

PULMONARY ROENTGENOLOGY*

By A. W. CRANE, Kalamazoo, Mich.

In no department of medicine is the art of physical diagnosis brought to a higher point of perfection than in the examination of the chest. The ear of the internist is trained to the utmost niceties of tone, pitch and volume. The educated sense of touch in the examining fingers makes the laying on of hands a miracle of diagnosis. The skillful examiner is the product of natural aptitude and long training. It is not strange, therefore, that we find in our confreres a jealous pride of craft which excites our admiration.

A method of examination which claims a delicacy, rapidity, and precision outranking the stethoscope and the percussion finger must expect to run a gauntlet of merciless criticism. Such a gauntlet has been run for the last 15 years and we will now examine the tattered remains of the roentgenological method and see if the breath of life is still in it.

Improvements in technique have injected new vigor into pulmonary roentgenology. The instantaneous skiagram gives clear, minute definitions to hilus structures which in life are never free from the quiver of the heart impulse. Better screens, better tubes, better diaphragms, better stereoscopes, better stands and tables, all have contributed their quota.

In the effort to ascertain what there is of actual value in the X-Ray examination of the lungs, many workers have run series of cases of various ages where the physical examination and the X-Ray examination are separately recorded by different workers, and then compared. Post mortem examinations, the pathologic section of tissues giving X-Ray shadows, the skiagraphy of the lungs removed from the thorax, the injection of opaque material into pulmonary blood vessels and into the bronchial tree, the production of artificial pneumothorax in the living, the study of stereoscopic series and the cinematographic films, have added, some little, and some much, to the certainty of roentgenological interpretation in health and disease. America is given credit for some of this investigation by Orton, who, in 1913, before the English Royal Society, stated that "nine or ten years ago Hickey, of Michigan, showing that these lines [at the roots of the lung] were due to pulmonary vessels." (1)

It thus became apparent that until the X-Ray was used, the real status of the average lung of the average healthy man was unknown. In cases of pulmonary disease, also, the X-Ray enables the examiner to detect infiltration, consolidation, cavity, enlarged, inflamed, caseated or calcified glands, peribronchial inflammation, bronchiectasis infarct, abscess, adhesions, fibrosis, pneumokoniosis, pneumothorax and fluid in the pleural sac whether free or encapsulated. The location and extent of these lesions may be defined by the X-Ray with a certainty and rapidity which is beyond the power of the physical examination to maintain. The plate remains an unimpeachable record for reference or for comparison of cases.

The information elicited by inspection, palpation, percussion and auscultation is not in each case co-extensive with the information gained by the screen and plate. By palpation we may feel the rhonchi, the friction fremitus, and the vocal fremitus. The rhonchi and the friction fremitus denote conditions which give no X-Ray sign. The vocal fremitus is increased over consolidated areas and decreased over emphysema-

* Read before Chicago Medical Society, October 14th, 1914.

(1) Arch. of the Rönt. Ray, P. 33, June, 1913.

tous areas. In this it agrees exactly with roentgenoscopy. If, however, we draw the conclusion that whenever the vocal fremitus is increased, we should find an increased density in the fluoroscopic shadow, and *vice versa*, we will be disappointed. In pleuritic effusions we find the vocal fremitus decreased or absent, but we find the fluoroscopic shadow dense and unmistakable. The same is true of pleuritic thickenings, of filled cavities, and of consolidations with occlusion of the large bronchi. Moreover the vocal fremitus is increased over dense-walled cavities which would give a ringed area of light-reflex upon the fluoroscopic screen. In these states it could be said that the results of palpation are not parallel with those of roentgenography. It is simply that the narrow limits of palpation must be kept in mind, and only its positive data considered.

Between percussion and roentgenoscopy the comparison is closer. The same factors which determine the X-Ray shadows, also determine the character of the percussion note. The results of percussion and skiascopy must agree, allowing for the personal equation and for the superior delicacy of one or the other in different hands. In my experience they do agree, except that roentgenoscopy is the more delicate and precise method.

The field of auscultation is larger in some directions than that of pulmonary roentgenoscopy. Affections of the bronchial tubes denoted by rales, and inflammation of the pleura denoted by friction sounds, are beyond the province of the X-Rays. Auscultation is a most delicate method of examining the thorax, and the data which may be elicited are numerous. But their interpretation is often a matter of confusion or doubt. Changes in the vesicular breathing, amphoric breathing, broncho-vesicular breathing, rales, large, small, dry, moist, sonorous, sibilant, crepitant, sub-crepitant, mucous or bubbling; friction sounds, bell-tympany; succussion; metallic tinkling; bronchophony; pectoriloquy; egophony; Wintrich's change of sound; Williams' tracheal tone; Gerhardt's change of sound; Friedreich's change of sound; and Leitz's metamorphosing; all of these suggest the difficulties as well as the resources of auscultation.

Roentgenography gives more simple and direct data. The apparatus which generates the Roentgen rays may be complex, but there is nothing unduly complicated about shadows on the fluoroscopic screen. The shadow of a bottle partly full of water gives more simple and more direct evidence of its existence and character than do the sounds which may be elicited from it.

Roentgenography is not compared with inspection because it is itself inspection. It is an extension of our faculties of sight. It is, therefore, a part of the physical examination and not a method to supplant it. Although it bears comparison with the combined results of palpation, percussion, and auscultation, it should not be considered as a rival, but as an ally. We base a diagnosis, not upon the results of one, but upon all the lines of physical examination. Roentgenoscopy should be interpreted in conjunction with the physical signs and the clinical symptoms. We never need, like Paganini, to execute our score upon a single string.

We should respect the diagnostic resources which lie in the fingers, eyes and ears of the humblest practitioner. Inspection, palpation, percussion and auscultation open to the examiner a *range* of signs which the X-Ray cannot equal. But such is the supremacy of the eye and such the importance of things seen, that even after a skillful physical examination, the X-Ray image comes like a revelation.

DIFFERENTIAL DIAGNOSIS

Differential diagnosis in roentgenoscopy is a matter of transparency, shadow, and motion. A transparency indicates a large, empty cavity or a large pneumothorax. If it is a cavity, the transparency may be centrally located and wholly surrounded by a dark or black shadow, or it may be peripherally located and only partly surrounded. The limits of a large cavity are never sharply marked unless on the lower side, when partly filled with sputum. If it is a pneumothorax,

the transparency is peripherally located and usually larger than in the case of cavity. If it exists without the presence of pulmonary shadows, the diagnosis is clear, because cavities are always associated with some consolidation. If, however, consolidation does occur with pneumothorax, the outline of the lung will be observable. A local pneumothorax from bronchial communication with the pleural sac and from circumscribing adhesions, could not be distinguished from a peripheral cavity, especially if it occurred over the front or back area. Its position, however, whether front or back, could be determined. The closer any object lies to the fluoroscopic screen the cleaner the image.

A circumscribed moderate transparency indicates a small cavity; a large cavity nearly full, a small pneumothorax, a greatly dilated bronchus, or an emphysema. If it be a small cavity, it will lie in the midst of a dark or black shadow, and may be called a light reflex, because it is in contrast with its surroundings. It may be encircled by a narrow ring of dark or black shadow if the walls are calcified. This is a healing process that can occur in a small cavity only. Why the calcareous thickening of a spherical cavity will cast the shadow of a ring is easily understood. The X-Rays traverse more substance in passing through the edges of the rim than in passing through the middle.

If it is a large cavity nearly full, the transparency will rest upon a dark or black circumscribed shadow, unless the surrounding consolidation is so dense as to obscure the shadows of the mass of sputum. If the patient is re-examined on the table, the cavity may empty and become a large bright transparency or it may nearly disappear, because the mass of sputum has come to lie in line with the empty space. If a faint reflex be observed without the presence of pulmonary shadows, it is likely due to a dilated tube in bronchiectasis. A dilated bronchus with consolidation could not be distinguished from a small cavity, unless a longitudinal form were to give a clue. A small pneumothorax, allowing a layer of air to surround the lung, would give a general light reflex, which would be distinguishable from a true emphysema by the profile of a lung made denser by partial collapse. In both cases the movements of the diaphragm would be restricted, its line low and its form flattened. But an emphysema is bilateral, unless there is some disease of one side to produce a compensatory condition on the other. In the case of pneumothorax, the disease would be on the same side as the general transparency. Hydro-pneumothorax or pyo-pneumothorax would give the same images as pneumothorax, except that we would have the dense shadows of effusions at the base. By changing the position of the patient, the relative position of the shadows and the transparencies would be changed, if the fluid is not encapsulated.

A light shadow may mean an infiltration, a congestion, an atelectasis, or a thickened pleura. Between a tuberculous infiltration, a simple focal congestion, and an atelectatic area, there is no shadow-distinction. A thickening of the pleura may sometimes be differentiated from the front, and nearly or quite invisible from the back. But an infiltration or small consolidation lying close to one side would simulate this appearance.

A dark shadow indicates a partial consolidation, an infarct, or a cirrhosis. In the case of edema the dark shadow is general and of even density. A general cirrhotic lung would give a less even shadow, and would be accompanied by a marked displacement of the heart. Other physical conditions easily differentiate these two. A focal cirrhosis, an infarct, and a small tumor, may give shadows of similar character, but a cirrhotic focus is most likely to be located in the apex; a tumor most likely near the hilum; and an infarct most likely in the periphery of the lung. A partial consolidation has very definite borders shading out into normal lung tissue. A small filled cavity is associated with some consolidation, and will appear as a dark spot in the midst of a dark shadow.

A black shadow may result from a consolidation, gangrene, large filled abscesses or cavities, large tumors, large hydatid cysts,

and pleuritic effusions. The last is distinguished by lying at the base of the thoracic cavity, by obscuring the diaphragm-line, by a more or less level upper border, and by being shifted when the patient's position is changed. The other conditions may not be separable by an X-Ray examination, although their boundaries may be mapped out.

THE DIAPHRAGM

The diaphragm cannot be disregarded in roentgenoscopy of the lungs. Its visibility, position, form and motion are functions of the highest importance in estimating the extent and severity of pulmonary disability. It is the vital barometer of the lungs, and may give the first signs of coming clouds above.

Its visibility depends upon the contrast which its heavy shadow makes with the thin shadow of the lung. It is a dome of muscle which rests upon the liver on the right and is visible across the whole extent. On the left it rests upon the stomach and is visible across the outer half, being obstructed by the shadow of the heart. In forced inspiration, however, the diaphragm becomes also visible below the heart. The shadow-line of the diaphragm becomes more distinct in forced inspiration, because the lungs contain more air and because the diaphragm, being flatter, interposes more tissue in the path of the rays. Conversely, the diaphragm-lines become less distinct in forced expiration, because the lungs contain less air, and because the diaphragmatic dome, being more arched, interposes less tissue in the path of the rays.

The diaphragm becomes very distinct when there is an emphysema or pneumothorax without effusion. But emphysema is either bilateral or else compensatory and attended by disease on the opposite side. On the other hand, pneumothorax would show the shadows of a partially or wholly collapsed lung. The diaphragm may become indistinct in edema, hypostatic congestion, partial consolidation of the lower lobes, or thickened pleura around the base. But in edema there is a general shadow of even density. In congestion, partial consolidation and thickened pleura at the base, the upper areas of the lung may be normal. But these three are not separable on physical grounds alone.

The diaphragm becomes invisible when there is an effusion or a consolidation of the lower lobe. But with effusion the outline of the shadow may be easily shifted, and when the patient is placed upon the examining table with the head lowered, the diaphragm comes into view. If the entire lung is consolidated or if the effusion reaches to the apex, the conditions may be indistinguishable without the use of the hyperdermatic needle.

The position of the diaphragm in health is variable. The mean in the ordinary respiration is, for the right side, the lower border of the fifth rib, and, for the left side, the upper border of the sixth rib. The left side is normally about 1 1/3 cm. lower than the right. In disease of one side this difference is exaggerated.

If the right lung is affected by tuberculosis, the diaphragm on that side will be higher than usual, while on the left it will be lower than usual, on account of the compensatory changes. In emphysema the diaphragm lies very low, in cirrhosis very high.

The position of the diaphragm largely determines the form. It is flattened when low, and arched when high. In diaphragmatic hernia the form is irregular.

It is the motion of the diaphragm with which we are chiefly concerned. We may recognize the range of movement in ordinary and in forced respiration. By marking the middle point in ordinary respiration, we may observe the upper and the lower half of a forced respiration. As a rule, in health the range of ordinary and forced respiration is slightly greater on the right side than on the left. A restriction in the range of motion is a sign of some disablement. It is most likely to mean tuberculosis, pneumonia, or pleurisy. But it may mean almost any affection of the lungs or mediastinum. In true emphysema and pneumothorax the respiratory movement is restricted in its up-

per half. In compensatory emphysema the respiratory movement is increased in both upper and lower half. This is important, because a compensatory emphysema on one side means an impairment of the lung on the opposite side. It may, however, in rare cases, be an old trouble from which the patient has recovered. A very marked restriction in the motion of the diaphragm to its immobilization is a grave sign. Pleurisy, especially diaphragmatic pleurisy, forms an apparent exception. However, if the patient be encouraged, the diaphragm can be moved, although pain is the result. It is a significant fact that nature so quickly immobilizes a diseased lung.

When in addition to the shadow-free lung, we find a natural movement of the diaphragm, we may feel assured that even though tubercle bacilli are present in the sputum, the prognosis is good.

EARLY TUBERCULOSIS

It is the diagnosis of early tuberculosis that chiefly concerns the internist in pulmonary cases. The X-Ray has led to the belief that in children the primary tubercular focus is always in the hilum of the lung and that in adults it is usually there also. Bythell in conjunction with his colleague, Paget Lapage, in the Manchester Children's Hospital, stated before the English Royal Society of Medicine, February, 1913: "My experience has been that, in children at all events pulmonary tuberculosis *invariably* starts at the roots of the lungs. Out of 300 or 400 children which I have examined systematically for this purpose I have never seen a single case in which the disease had not obviously originated at the hilus of the lung, and I have yet to meet one in which the sole or even the primary lesion has been apical."

Jordan of Guy's Hospital, states in the British Medical Journal, August 31, 1912: "In every case the invasion takes place by way of the hilus. . . . From the hilus the disease spreads in all directions but most rapidly along the ascending and descending branch of the main bronchus. Sooner or later the disease reaches the apex. . . . Very soon the apex appears to be the chief seat of the disease."

The Germans accept this view. The 1st volume of the Roentgen-Kunde of Rieder and Rosenthal, 1913, opens the chapter of chronic tuberculosis by the statement: "The hilus is always the regular port of entry from which the tubercle bacilli spread." Prof. Rieder gives 66 cuts of the lungs in tuberculosis. All but seven show the hilus origin and these seven show pleuritic effusion.

It becomes apparent that early tuberculosis must be looked for in the hilus tissues. The pretubercular stage is a myth. The tubercular process is already present in every case of tuberculosis that shows the familiar daily temperature of 99, the acceleration of the pulse and the languor of tuberculin absorption. But this early focus of tuberculosis is beyond demonstration by the methods of physical examination. If signs are obtainable below the clavicle or in an apex the case is already beyond the beginning stages. Auscultation and percussion along the spinal margins is futile because of the massive structures present to transmit sounds and overlay the percussion note.

The study of hilus structures must be left to the X-Ray. However at this point where the first skiagraphic signs appear is the point of greatest difficulty in interpretation. The lymphatics of the hilus drain the lungs and are a chain of forts guarding the system from further invasion. An arrested case of tuberculosis or any other respiratory infection is arrested in the hilus structures in the average human being. These lymphatic glands and spaces are also the dust bins of the lungs as seen in city dwellers. The hilus clusters are therefore the rule in chest plates. They are present in the tuberculous and the non-tuberculous; in old healed cases and in fresh progressive cases: often in the young before three: always in the adult after 30.

It is only too easy under these circumstances for the X-Ray to determine what the tuberculin test does—detect disease in the healthy and out of the evidences of an ac-

complished immunity construct a diagnosis of active infection. A critical study of radiographic signs that can be relied upon to differentiate a fresh progressive lesion from closed foci shows us that there are yet worlds to conquer in roentgenology. It is particularly at this point that instantaneous stereoscopic plates endow the observer with a diagnostic vision incomparably superior to that of any other method. The images of overlying glands and structures are thus lifted into their true special relations. If he can detect a ruptured gland with a delicate shadow of inflammation extending from it often in many radiating lines, the peribronchitis of Jordan; if he can identify inflammatory nebula that have not yet been resolved into definite forms; if he can see that a cloud has gathered over a part or whole of one hilus-cluster, then he has perhaps done all that can be expected of a skillful roentgenologist.

Here the X-Ray has left the diagnosis precisely where the physical examination leaves it at a later stage of the case. The identification of the nature of the infection in every case is bacteriological. The fact that pulmonary invasions detected clinically or by the X-Ray are tubercular 19 out of 20 times does not enable us to make a diagnosis, but only to state probabilities.

Whether or not the process is tubercular is rarely decided by the X-Ray alone. It is decided with still greater rarity by physical signs alone. As diagnosticians we need all signs and all symptoms, the clinical history and the laboratory findings. Let not the consulting room of the internist, the laboratory and the X-Ray room become chambers of discord. The diagnostician without the X-Ray is blind but he who is without the stethoscope and the percussion is deaf. Let not the deaf argue with the blind for such is without profit. But let the deaf put away their deafness and the blind put away their blindness. Then will a miracle come to pass—that the art of diagnosis will have a new birth.

A SIMPLE CONTRIVANCE FOR REDUCING POTT'S FRACTURES OR ANY LATERAL DISLOCATION OF THE ANKLE JOINT

By ANGUS McLEAN, M. D., Detroit, Mich.

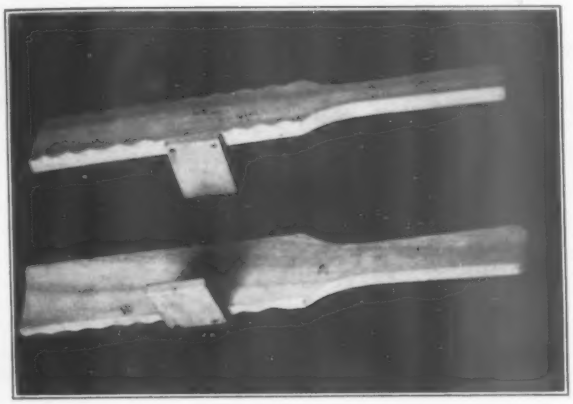

Fig I

Figure No. I shows a very simple contrivance for reducing lateral displacements of the ankle joint. It is one that can readily be improvised anywhere. It consists of a strip of wood about two feet in length, three inches wide and about one inch thick. One end or about 1/3 of the strip is shaped in the form of a handle and the other end or other two-thirds is grooved longitudinally, that is, made somewhat concave transversely to accommodate itself to the convexity of the lateral aspect of the leg. A little block three inches wide and four inches long is screwed to the edge, at about the middle of the strip of wood in such a manner that when the two-thirds concave surface is placed in contact with the lateral convex part of the leg it will lie directly dorsal to the heel. The ankle upon which this instrument is to be used, whether the right or left, will determine the direction in which the block of wood is fastened to the strip. On the surface opposite the longitudinally grooved one, small transverse notches are cut. These will prevent the bandages and straps from slipping. See Fig. I.

Figures II and III show the application of this contrivance to the left leg in a case of Pott's fracture with lateral displacement. The longitudinally grooved two-thirds are placed in contact with the lower convex side of the leg and held there by a strong cotton bandage. To secure a more unyielding hold on the leg, the cotton bandage is reinforced by a leather strap. The block under the heel and the foot, especially the region over the lateral side of the astragalus, is well padded. The surgeon stands on the tibial side of the leg. The right hand (in case of injury to the left ankle) grasps the handle of the wooden strip and the left hand grasps the leg just above the medial maleolus. The thumb of the left hand is placed just over the point of fracture of the medial maleolus. The pad over the astragalus is used as the fulcrum of a lever and while the right hand pulls on the handle the left hand is pushing the tibia in the opposite direction, the thumb of the left hand guiding, as it were, the extent of inward reduction of the foot. The

Fig. II

Fig. III—Same as Fig. II reversed

Fig IV—Pott's fracture two weeks' standing; before reduction.

block just dorsal to the heel prevents the foot from slipping posteriorly and if a little anterior gliding of the foot becomes necessary to effect a proper reduction, it can readily be accomplished by simply causing a little traction on the handle in that direction. A decided snap is often felt when reduction occurs. At first thought it would seem that a new fracture of the leg might be produced by the enormous amount of force that can so easily be exerted by this leverage device. Such an accident, however, has never occurred in our cases. Sometimes it is necessary to apply a few turns of a strong cotton bandage to the foot in such a way that an assistant can, from the ends of this bandage, make traction on the foot while the surgeon is reducing the displacement by leverage, exerted from the handle of the wooden strip.

By means of this simple contrivance, we

Fig. V—Same as Fig. IV; after reduction

have been able to reduce lateral displacements in cases of two or three weeks' standing and even after repeated attempts had failed by other methods.

The accompanying skiagraphs of a few cases before and after reduction will demonstrate the efficacy of this method. We believe it is worthy of a more universal trial.

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Detroit, Mich.

Fig. VI—Fracture of lower end of tibia and fibula due to direct violence; before reduction.

Fig. VII—Same as Fig. VI; after reduction.

AN IMPROVEMENT IN THE TECHNIQUE OF GALL BLADDER DIAGNOSIS*

By GEORGE E. PFAHLER, M. D., Philadelphia, Pa.

During a number of years we, as Roentgenologists, had practically abandoned efforts at the diagnosis of gall-stones and gall-bladder disease. With improvement in technique I believed that we might hope for better results, and in October, 1910[1], I presented a paper upon this subject before the American Roentgen Ray Society. Since then encouraging reports have been made by Doctors Case,[2] Cole,[3] George and Gerber,[4] and myself.[5] We have all concluded that about 50 per cent of gall-stones can be shown by good technique and careful observation. I now make it a routine part of every stomach examination, and I believe that considerably more than 50 per cent can be shown. In some instances the stones are so dense, as the result of lime deposit, that they can be shown by any technique and seen by anybody, but in my experience this type is rare. In most cases the diagnosis can only be made by careful technique and careful observation by a trained eye and with the best illumination.

In the study for gall-stones the method of illumination of the plate is most important. For this it is desirable to have a pure white reflected light come from one direction, with the remainder of the room darkened so far as possible. The plates should then be held obliquely and at some distance from the light, so that the faint shadows can be more clearly outlined. It is important to be able to distinguish the outline of the kidney, the outline of the lower border of the liver, and then, by giving due consideration to the relative position of the patient and the tube during the examination, the probable location of the gall-bladder can be determined (bearing in mind that the position of the gall-bladder is variable). Then a careful study of the plate will often show a mottling and increased density in this region, but not a definite and clear outline of stones. In this way I have been able to detect in some instances almost pure cholesterin stones.

The *new position*, to which I desire to call the attention at this meeting, is especially useful in differentiating gall-stones from kidney stones, which differentiation is really essential in many instances, the importance of which was forced upon me especially recently, when a competent Roentgenologist found a stone within the shadow of the right kidney in a young man, age twenty-five years, whose symptoms pointed entirely to the urinary tract. A diagnosis of urinary calculus was made, and the patient was advised to be operated upon, but before operation he was sent to me for confirmation of the diagnosis. Under these circumstances I made several plates of the right kidney in one of which I found the shadow of a stone projecting slightly above the shadow of the kidney. I then had the patient return for a second study, and proved beyond a doubt that the stone was not in the kidney but was in the gall-bladder.

TECHNIQUE

The patient is placed obliquely upon the right side. The cylinder is compressed strongly into the epigastric region, so that

*Read before a Meeting of Roentgenologists at Atlantic City, N. J., Jan. 30, 1915.

[1]Pfahler, G. E.: Detection of Gall-Stones by the Roentgen Rays, Am. Quart. Roentgenol., April, 1911.

[2]Case, J. T.: Roentgenoscopy of the Liver and Biliary Passages with Special Reference to Gall-Stones, The Jour. of the Amer. Med. Ass., Sept. 20, 1913, Vol. LXI., pp. 920-924.

[3]Cole, Lewis Gregory: The Roentgenographic Diagnosis of Gall-Stones and Cholecystitis, Surg., Gyn. and Obst., Feb., 1914, pp. 218-227.

[4]George and Gerber: The Demonstration of Gall-Stones by the Roentgen Ray, Boston, Med. and Surg. Jour., Vol. CLXX., No. 18, pp. 680-681, Apr. 30, 1914.

[5]Pfahler, G. E.: The Roentgen Rays in the Diagnosis of Gall-Stones and Cholecystitis. The Jour. of the Amer. Med. Ass., Apr. 25, 1914, Vol. LXII., pp. 1304-1306.

Fig. I—Shows the gall-stone lying within the shadow of the kidney.

the center of the cylinder is resting posterior to the right costal border. This will project the shadow of any gall-stones clearly to the outer side of the kidney. I now use this as one of the positions in my routine examinations, and at times I am able to obtain more definite shadows of stone in this position than in any of the others.

The angle at which this examination is made can be varied, and of necessity must be varied, according to the thickness of the patient. In fact, I usually make two or three oblique views because, strange to say, I commonly find evidence of stone in one plate and none at all in several others. My routine at present, for examination of gall-stones, is a direct anteroposterior plate, with the central ray passing just below the right costal border. This usually gives the outline of the right kidney and will show any stone that is present in the right kidney. It will also be of value in differentiating kidney-stone from gall-stone. I then make one or more oblique views of the right side, passing the central ray outside of the normal border of the right kidney.

The patient is then turned on the abdomen and an 8 x 10 board placed under the right side, with a wedge under the lower border so as to raise this lower border about three inches. This brings the plate in close contact with the gall-bladder region. The patient is then bent to the left and slightly rotated to the left. This opens the angle between the ribs and the crest of the ilium, and also decreases the amount of tissue through which the rays must pass to reach the gall-bladder. I usually make three or four plates at different angles in this position.

I then make a study of the stomach and duodenum, which is valuable for differentiation and also for confirmatory evidence in the diagnosis of gall-stones. In one or two instances I have obtained the record of gall-stones in the stomach studies more clearly than in the special gall-bladder plates. Unless the stones contain a very high percentage of calcium I rarely find the evidence in all plates, and often only in one or two. This will give one explanation of why gall-stones have been overlooked in the past, when we only made one or two plates including this region.

Part of our recent success is due to the multiple exposures which give us varying conditions in time of exposure and degree of vacuum, and part of it is due to improvements in position, but more than anything the success is due to careful study of the plates.

Fig. II—Shows the gall-stone projected out ide the kidney shadow by the technic which I have described.

DEMONSTRATION OF SALIVARY CALCULI

By P. M. HICKEY, M. D., Detroit, Mich.

Fig. I

The demonstration upon the Roentgen plate or films of calculi impacted in the salivary duct is frequently attended with some technical difficulties. The usual lateral or oblique position as used for the demonstration of the lower molars is often unsuited for these cases, and a negative report may consequently be made which is inaccurate. A case recently presented itself for examination, and from the clinical symptoms calculus was undoubtedly present, and yet an ordinary lateral plate failed to show a stone. Accordingly, the following procedure was employed: Patient was allowed to lie supine upon the table with the head projecting far over the end. (This position resembles the one recently recommended by Dr. Bowen for the demonstration of the sphenoidal sinuses.) A large film, the size of which is shown in the accompanying reproduction, was placed in the mouth and held in position by the closure of the teeth; the rays were then directed from above downward with the central rays passing through the center of the mouth. See Fig. 1. The films when developed showed a small salivary calculus, as in Fig. 2. Upon operation, the stone was found as indicated in the films.

Fig. II—Salivary Calculus.

Antero-posterior view showing head of humerus apparently in normal relation to the glenoid fossa.
DR. THOMAS, CLEVELAND.

Vertical view of same shoulder showing that head of humerus is not in normal position but is dislocated posteriorly.
DR. THOMAS, CLEVELAND.

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EDITORIAL

We are in receipt from Dr. Pfahler of a card from Berlin, announcing the death of Heinz Bauer, who died June 9th, 1915, from diphtheria. He was perhaps best known as the inventor of the Bauer Tube and contributed considerable to the progress of the art. He will be remembered by many Americans who had the pleasure of meeting him and who appreciated his uniform courtesy. We would extend to his bereaved family, on behalf of our members, our sincere condolence.

In the present issue of the Journal will be found an article which we think will be much appreciated by many of our readers; namely, one by Dr. McLean on "Reduction of Lateral Dislocations of the Ankle." We feel that the position of the Roentgenologist is emphatically that of a teacher. Difficult cases are constantly presented to him for examination and, if he is sincerely interested in his work and in the restoration of the patient's health, he will be able to suggest to the one in charge of the case methods of approved treatment. The education, therefore, of the Roentgenologist is a matter of great importance. If he is in the photographic class, his work is no more valuable than the photographers'. If his range of reading has lifted him above this, he should be ranked as a consultant. Accordingly, we think journals devoted to Roentgenology should incorporate in their pages not only articles of technical importance but those which tend to render the Roentgenologist more fitted to give suggestions in regard to treatment.

We have had the pleasure of seeing some of the advanced sheets of the Atlas of Drs. George & Leonard, which is noted in the advertising pages. From the specimen pages, we think that the work will be most valuable and beautiful. It is a sad reflection upon American scholarship that so few works on Roentgenology have been published in English. The early work of Williams, Caldwell and later Kassaban, while comprehensive from the fact that a great deal of ground was covered, still did not take up any one subject fully. It is, therefore, an encouraging fact that we can note the publication of such a work and to know, furthermore, that other American authors are engaged in bringing out works which will be of great educational worth.

FORECAST OF THE PLATE EXHIBIT AT ATLANTIC CITY

All of the twenty-seven frames owned by the Society have been assigned. The list of exhibitors follows with such information about the exhibits as is now available:

Dr. Wm. B. Bowman (36 5x7)
Dr. Percy Brown
Dr. Jas. T. Case (16 8x10)
Dr. Albertus Cotton
Dr. Byron C. Darling
Dr. John S. Derr
Dr. Kennon Dunham ("Just Lungs")
Dr. Paul Eisen
Dr. Wm. A. Evans
Dr. A. W. George
Dr. G. W. Grier
Dr. P. M. Hickey (Special exhibit stereoscopic plates of the lower spine)
Dr. A. Holding (48 lantern slides before and after treatment)
Dr. Geo. W. Holmes
Dr. Leopold Jaches
Dr. Geo. C. Johnston
Dr. H. M. Imboden
Dr. Sidney Lange
Dr. F. M. Law
Dr. L. T. LeWald (reserves space for 4 extra frames)
Dr. W. F. Manges (gastric and duodenal ulcer, Pirie method)
Dr. Myron B. Palmer
Dr. H. K. Pancoast
Dr. Geo. E. Pfahler (showing results of deep therapy of primary carcinoma of lung)
Dr. A. Judson Quimby
Dr. Leonard Reu
Dr. Edw. H. Skinner
Dr. Wm. H. Stewart

As indicated by this arrangement, each exhibitor will have all his plates in one frame and no attempt will be made at pathologic grouping. The Catalog, a four-page folder, will give name and address of the exhibitor, the location of his frame, by letter, and a very brief description of his exhibit, as a unit. The space assigned for the exhibit by the Hotel Managers is ideal, and another success for this feature is assured.

ABSTRACTS

Archibald, C. H., M. D., New York: Roentgenotherapy in Cancer. (New York Medical Journal, June 5, 1915, vol. CI, No. 23, p. 1157.)

A brief outline of a few cancer cases treated with the Roentgen ray is given by Archibald:

CASE I. Woman, aged forty-four years; condition diagnosed as carcinoma of cervix. Patient suffered from constant flowing, great emaciation, exhaustion and cachexia. Examination revealed erosion of cervix, with grayish slough and characteristic odor. Extirpation was offered and refused, owing to extreme weakness through hemorrhage. Irradiation began May 10th and continued until August, ten minutes daily through a speculum to cervix, and ten minutes through abdomen over pubis, for its sedative effect, massive doses being given. A topical application of a twenty per cent aqueous solution of ichthyol with a pinch of tannin on tampon was applied to cervix after each raying. The flow was immediately arrested, the erosion healed, menopause became established, and nutrition rapidly improved. The irradiation was continued for an additional seven months, every third day, and all evidence of the local lesion and malignant character disappeared, except an irregular cicatrix, and now after eight years the woman is apparently well and active, having gained about forty pounds in weight.

CASE II. Woman, aged forty-seven years, large, florid, and well-nourished; menstruation irregular; had right breast removed; diagnosis, cancer. Examination showed a prompt recurrence in the scar, with hard nodules scattered throughout the skin below the wound and around the right side. The left breast was involved, and also swollen to double its normal size, and indurated, showing the disease attacking there. Irradiation was advised as a forlorn hope; massive doses daily for a month were given, then every third day for two months, then once a week, then every two weeks.

The result was a healed ulcer, a flattening out of the growth, reduction to normal size and texture of the left breast, and resorption of the nodules. This was a hopeless case, from the surgical standpoint.

CASE III. Woman, aged thirty-nine years, twelve years ago was in a sanitarium and discharged as inoperable, owing to valvular heart affection. Diagnosis, carcinoma of uterus. Examination revealed a fungating growth, one inch and a half by two inches, involving the anterior half of uterus with ulceration, occasional flooding, and ichorous discharge; tenderness over abdomen, parametric adhesion, and a mild subacute peritonitis existed. The same technic was used as in Case I, with slight modification, and equally good results. The patient, at fifty-one years, attends to her social duties, is the wife of one of our university professors, and is socially active.

CASE IV. Woman, aged forty-one years, single, school teacher. Diagnosis, bleeding uterine fibroid about the size of an orange. Constant flowing for six months. Heavy irradiations through abdomen alone were given every second day for six weeks, when flowing and discomfort ceased altogether. For four months more semi-weekly irradiations were administered. Owing to her employment, no more could be given. After a year and a half, with an occasional irradiation, all evidence of the fibroid disappeared and she is now attending to her school duties. No other treatment was administered, except a rectal suppository of belladonna, camphor, and tannin. Menstruation ceased in this case after the second or third month of raying, which is the usual result in heavy irradiation.

Three cases of carcinoma of the tongue within the year have responded and been healed with massive doses of the rays.

Sudo, M.: Study of Diseases of Stomach and Duodenum by Roentgen Ray. (The Sei-I-Kwai Medical Journal, July 10, 1915, vol. XXXIV, No. 7, p. 37.)

The author described the histories of 69 cases examined by Roentgen ray and verified by operation, and after carefully studying them, together with cases previously reported, came to the following conclusions:

1. The Roentgen ray diagnosis of stomach and intestine is not only more certain than other methods in knowing the conditions of disease from clinical aspect, but it is moreover able to find out hour-glass shape, non-palpable carcinomatous tumor, perforative ulcer, etc., which cannot be ascertained by other methods.

2. There are many causes bringing about mistakes in Roentgen ray diagnosis, so you must pay great attention to various clinical symptoms and must not make hasty diagnosis.

3. The absence of shadow in Roentgen ray diagnosis of stomach cancer is very important and its shape shows some peculiarities, according to varieties of cancer. The position and size differ somewhat from its real position and size. But the absence of only shadow is not really diagnostic of the presence of tumor, because it may be present in other diseases of stomach, etc.

4. Early diagnosis is still impossible.

5. In cancer of pyloric end and its near neighbor, the discharge from stomach is generally delayed.

6. The cancer of pylorus and its near neighbor often causes the dilatation of part below the tumor.

7. The differential diagnosis between malignant and benign pyloric stenosis is often very difficult if there be no marked or palpable tumor, but the balloon-like dilatation of pyloric depression and strong slow peristalsis generally denotes benign stenosis.

8. The constriction in cancer of cardiac end and its resultant hour-glass stenosis can be seen sometimes and helps diagnosis.

9. The cancer very rarely extends over the pylorus into the duodenum, but in cardiac end it often invades the esophagus. Such secondary esophageal cancer is difficult to distinguish from primary one by other methods, but by Roentgen ray you can see some differential points.

10. By Roentgen ray examination you can comparatively accurately settle the advisability of operative treatment.

11. There is no special sign of duodenal ulcer or stenosis, but if there be right-sided position of pylorus, strong active peristalsis, long-continued presence of duodenal and localized tenderness you can be almost sure of diagnosis.

12. Duodenal ulcer and gall-stone Roentgen ray shadows are similar and often cause trouble in differentiation.

Caldwell, John R., M. B., Ch.B., St. And., Lieutenant, Royal Army Medical Corps: The Roentgen Ray Theatre in War Hospitals. (The Lancet, April 24, 1915, vol. CLXXXVIII, p. 854.)

There are two chief reasons why Caldwell pleads for the installation of a Roentgen ray theatre in all large war hospitals. First, the speed with which extractions can be performed—a factor of importance both in that the maximum of cases can be done in the minimum of time, and in that prolonged anesthesia is avoided for the patient; and, secondly, the minimum of damage is done to the tissues.

To facilitate description, he roughly divides cases to be treated into two great classes: (1) old and healed; and (2) recent and septic. In the old and healed the preparation is as for an ordinary operation; the towels are applied in the usual fashion, but we might add that it is advisable to clip them firmly to the skin, so that in the darkness they may retain their position. A towel is set aside for the screen of sufficient size to cover its under surface completely with a margin all around of about two inches. This is laid over the cleansed area, and the screen is placed in position by the theatre orderly. The assistant now clips on the towel at the four corners, and for this purpose we employ Dieffenbach's bull-dog forceps. Before the actual commencement of the operation

the Roentgen ray tube is brought into the vicinity of the part involved, and with the orderly supporting the screen the rays are turned on and the lights off. The foreign body is now accurately "centered," and to effect this a small diaphragm is employed. The movements of the tube box can be accomplished with the operator's foot, and these are rendered easier if a toecap to receive the point of the boot be fixed to the front of the box. The point of a pair of Spencer Wells' forceps is now laid on the skin, so that it coincides with the shadow on the screen. The light is now turned on and the screen removed. With due regard to anatomical considerations, the incision is made, not necessarily immediately over the foreign body, for, indeed, an oblique approach is often easier. The skin incision should be fairly free, and when the muscles have been exposed blunt dissection can be employed. No violence in the extraction is permissible, and should the foreign body be in the vicinity of important structures, free and careful dissection in a good light is demanded, the operation being merely controlled by occasional reference to the screen. The forceps employed here for actually extracting foreign bodies are usually Kocher's or long Spencer Wells'. As a guide to the correct estimation of the depth of the foreign body, it is extremely useful, while the forceps are approaching, to move the tube box from side to side with the foot. The relative movement of the foreign body and the point of the forceps indicates their distance apart; for example, if the ball apparently moves somewhat faster than the point of the forceps, the ball lies somewhat deeper. With experience it is scarcely ever necessary to move the tube, more particularly in the case of the extremities, for here a slight rotatory movement of the part supplies the necessary information. The extraction having been performed, the wound is sutured in the ordinary way.

In septic cases, where a sinus exists, the preliminary cleansing of the part and of the sinus is of the utmost importance. For this purpose he employs a triple irrigating apparatus; three irrigators mounted on a stand are connected, so that each in turn may be made to discharge via one cannula.

The solutions employed are: (1) Biniodide of mercury (1 in 1000); (2) carbolic acid (1 in 40), and (3) hydrogen peroxide (1 in 3). The wound is copiously irrigated with these one after the other. This treatment may seem drastic, but is no more than is merited by the frightful septicity with which we so frequently have to deal. The actual extraction of the foreign body is now performed, but here free incisions are very desirable. It is usual to approach the foreign body by an incision which will, by reason of a dependent situation, afford the best drainage possible. In more quiescent cases an approach via the sinus is frequently sufficient. It is often of value to leave the forceps and the foreign body *in situ*, and enlarge the tract freely before extracting; in this way foreign matters, such as cloth, and so forth, perhaps of greater importance even than shrapnel and bullet, can be in many cases removed. With the guidance of the rays, Caldwell has removed foreign bodies from the posterior mediastinum, and from the spheno-maxillary fossa; then there was a pelvic case in which two previous abortive efforts had been made to extract a bullet. In this case he successfully removed the bullet interior from the region of the great sacro-sciatic ligament and the mantle of the same bullet from behind the neck of the femur. Foreign bodies in the neighborhood of the spine and in medulla of bones have likewise been removed with a success which is all the more gratifying as many of these cases showed evidence of previous attempts. In multiple shell wounds, this method of treatment gives much satisfaction; in these cases each wound in itself seems trifling, but the sum-total of upwards of six suppurating foci induces such a toxemic state that prolonged anesthesia and much interference are very undesirable. Caldwell prefers also to operate on compound fractures on the Roentgen ray table as the steps of the operation from start to finish can be controlled and guided by reference to the screen.

Case, James T., M. D., Battle Creek, Michigan: Basic Considerations in the Roentgen Study of Intestinal Stasis. (The Pennsylvania Medical Journal, June, 1915, vol. XVIII, p. 683.)

Generally speaking, Case's conception of an ideal colon is as follows: With the patient standing, the lower border of the cecum reaches as low as the iliopectineal line. The hepatic flexure extends upward as far as the costal margin. The splenic flexure reaches as high as the lower border of the spleen. The level reached by the lowest border of the transverse colon varies considerably in different patients, as well as at different times in the same patient. The shape of the normal colon varies with the type of individual. In short, stocky people, tending to obesity, the transverse colon, as well as the lower border of the stomach, is usually high, the lowest border of the transverse colon approaching a line joining the iliac crests. In tall, slender individuals, the transverse colon is apt to be V- or U-shaped, its lower border normally reaching several inches below the line joining the iliac crests, although in this same type of individual the transverse colon may lie well above the navel when the patient lies supine. The junction of the iliac and pelvic colon is well rounded out, not sharply angulated. The pelvic colon is very variable in length and disposition.

The colon should be freely movable throughout at all points which can be reached by the manipulating finger. It should be possible to move the tip of the cecum and terminal ileum upward for two or three inches. The ascending colon should be movable laterally for a distance of an inch or two. The hepative flexure is not often within reach of the palpating fingers, although at times the right half of the colon is so very mobile that the cecum, ascending colon and hepatic flexure can all be pushed over to the left side of the midline. The transverse colon itself is rarely adherent, although sometimes it is bound down in certain positions by adhesions of the omentum. The two legs of the hepatic loop, that is, the upper part of the ascending colon and the first part of the transverse colon, should be freely separable from each other. The same is true of the two legs of the splenic loop, although it is extremely rare for adhesions to exist between the two legs of the splenic loop. The descending and iliac colon are usually fairly well movable, except at the junction of the iliac and pelvic colon, where the mesocolon is normally very short. The mesocolon is also very short at the pelvirectal junction, but the pelvic colon itself should be freely movable. In heavy patients it is not always possible to test the mobility of the pelvic colon by actual manipulation of its loops, but, even in these cases, accurate deductions can be drawn from a comparison of the height reached by the pelvic loop during the filling of the colon by enema and by a meal.

Case's observations in man have almost to the minutest detail confirmed the work of Cannon on animals, especially in regard to antiperistalsis. The prevailing movement in the proximal colon is antiperistalsis, consisting of a movement of waves backward toward the cecum. These antiperistaltic waves do not run continuously for a long time, but periodically. A series of waves at the rate of perhaps five a minute can at times be seen continuing for four or five minutes.

Summarizing various observations, Case concludes that following a meal into which has been mixed two ounces of barium sulphate, the stomach should be empty within four and one-half hours, at which observation the head of the barium column should have reached the cecum. The entire barium meal should have passed into the colon by the eighth, or at the most the tenth hour, when the head of the barium column should have reached the middle of the transverse colon, or even the splenic flexure. The head of the barium column should reach the iliac colon from nine to sixteen hours following the ingestion of the meal, and the colon should be practically emptied of barium at the thirty-sixth hour.

Lange, Sidney, M. D., Cincinnati, Ohio: A Preliminary Report of the Roentgen Ray Treatment of Menorrhagia and Uterine Fibroids. (The Lancet-Clinic, July 17, 1915, vol. CXIV, No. 3, p. 59.)

Lange's report is based upon twenty cases of menorrhagia, dysmenorrhea and uterine fibroids treated by Roentgen ray exposures. The Coolidge tube was used exclusively. The results obtained in these twenty cases and the especially satisfactory outcome of thirty later cases in which an improved technique was employed, lead Lange to the conclusion that an artificial menopause can be elicited in any patient, irrespective of age, by this method of therapy, and that in properly selected cases the method is of extreme clinical value. In many cases one or two treatments suffice.

In the early series of twenty cases, eight were cases of severe and persistent menorrhagia or metrorrhagia. Seven were cases of uterine fibroids, and five were treated for dysmenorrhea.

Lange urges that great care should be exercised in the selection of patients for Roentgen ray treatment of the ovaries. A most careful local examination should be made to exclude cases having pelvic lesions which demand surgery. Especial care should be exercised to exclude these cases in which there is even a suspicion of malignancy.

The patients treated for menorrhagia varied in age from nineteen to forty-seven years. In all of them the condition was a very chronic one, and most of the patients had been curetted one or more times. All of the patients were weak and anemic, and several of them had to be conveyed to the office for treatment.

Treatments were given, as a rule, once a week.

In seven patients the bleeding was stopped and an artificial menopause was brought about. The greatest number of treatments given any patient was eight. One of the patients in whom the menopause was established was only twenty-eight years of age. This case is unique in that the patient was younger than in any of the cases recorded in the literature.

Another unique case in this series of menorrhagic conditions was that of a woman of forty-seven years, in whom the menopause was established after the first treatment. It is, of course, a constant observation in all cases that the production of the artificial menopause requires less time and fewer treatments as the age of the patients increases.

In two patients suffering with menorrhagia, included in this series, a menopause was not desired and the Roentgen ray treatments were undertaken to simply inhibit the ovarian activity. The patients were young, unmarried girls, aged nineteen and twenty-five years, respectively. In both, the excessive bleeding was controlled and normal menstruation resulted. The patient of nineteen experienced hot flushes after receiving six treatments, but this symptom disappeared after stopping the treatments.

Of the seven cases treated for uterine fibroids, the artificial menopause was produced in six. In the seventh case the patient was past the menopause and the Roentgen ray treatments were undertaken to relieve certain pressure symptoms by reducing the size of the fibroid. The ages of six of the patients varied from thirty-six to forty-eight years. One patient was sixty-five years old. There was present in five cases menorrhagia of varying degrees. The fibroids were of the intramural or subserous types. Roentgen ray treatment is usually futile and contraindicated in pedunculated submucous types. The size of the tumor mass or masses was reduced in every case. The reduction varied from thirty to seventy per cent.

Fujinami, G.: Roentgen Ray Treatment of Frost-Bite. (The Seki-I-Kwai Medical Journal, July 10, 1915, vol. XXXIV, No. 7, p. 38.)

In frost-bite the patient generally complains of itching mostly. The author seeing the effectiveness of Roentgen ray for itching in various skin diseases and in consequence believing its similar power against

frost-bite tried it on twelve patients, with the following results:

1. For frost-bite of the first degree, without much swelling, only one slight application was quite sufficient. In every case, the itching became much less from next day and in three or four days patients did not feel it even in bed or warm day. The swelling gradually disappeared after disappearance of itching.

2. For second-degree cases the swelling was present for a comparatively long time and required several applications. Hemorrhagic blisters became dry, fissures and ulcers cured following disappearance of itching after three or four applications of Roentgen ray.

Mackee, George M., M. D., New York, and Reimer, John, M. D., New York: The Roentgen Ray Treatment of Ringworm of of the Scalp. (Medical Record, August 7, 1915, vol. LXXXVIII, No. 6, p. 217.)

The following technique is the one in use at Dr. Fordyce's clinic. There is nothing original about the method, it being the result of the work of many investigators in the same field—Sabouraud and Noire, Holzknecht, Kienboeck, Adamson, Sequeira, Hampson, Pirie, Corbett, Coolidge, Macleod, and many others.

The first step, for convenience, is to cut the hair close to the scalp. The next step is to divide the scalp into four equal-sized triangular-shaped areas in the following manner: A mark is made (with a skin pencil) about two inches inside of the hair line, above the forehead, in the median line. This is designated point A. A steel tape measure is then placed with zero on point A and stretched along the median line over the vertex to the neck. At ten inches another mark is made—point B. This will usually be about two inches inside of the hair line of the neck, but will vary somewhat in accordance with the size of the head. Points A and B should be adjusted so that they are about the same distances inside of the anterior and posterior hair lines. As a matter of fact, A and B, in some instances, may fall exactly at the hair line, but this makes no difference so long as the distance between them is exactly ten inches. Point C is then indicated by a mark in the middle line exactly halfway between points A and B. On every skull there is a flat surface just anterior to the occiput and point C will fall from 1 to 1½ inches in front of the center of this area. As a matter of fact, it is a good idea to insist upon point C being exactly at this location and adjust A and B so that they will be just five inches anterior and posterior to C. Point D is then located just above and in front of the right external auditory meatus. The exact position of this spot is found by measuring five inches from A, B and C. Point E represents the same location on the left side. It is essential that each point be exactly five inches from every other point, with the exception, obviously, of the distance between points A and B, which should be ten inches.

The next step is to draw lines between the various points. This will divide the scalp into four triangular-shaped, equal areas.

Next, each point—A, B, C, D and E—receives an epilating dose of Roentgen ray in the following manner:

For point A the child lies on its back on a table. The entire face below the hair line is protected by a lead mask. The tube is placed with the anode exactly over and 6½ inches from point A. The vertical rays will strike point A, while half of the oblique rays will fall upon the anterior portion of the scalp, and the remaining half will strike the protecting shield on the face and be wasted. The measuring pastille is now placed on point A, and the epilating dose administered.

Points B, C, D and E are now to receive the epilating dose in the same manner with the following exceptions: For point C the patient may recline on a table or sit upright on a chair. No protection is required. Here the oblique rays spread over the anterior, posterior, and lateral portions of the scalp. For point B, the child may lie on his side on the table or sit in a chair with his forehead resting on the table. It is necessary to protect the neck, shoulders and back. Here half

of the oblique rays will reach the posterior portion of the scalp, while the other half will spread over the shoulders and back. For points D and E, the patient lies on his side on a table and the ears, face and neck are protected. Here, as in points A and B, half of the oblique rays are lost.

It is of the utmost importance that each treatment be at right angles to every other treatment. For instance, an imaginary line drawn from the anode to point A will be at right angles to lines extending from the anode to points C, D and E.

The vertical rays strike the five points while the oblique rays from one treatment overlap and reinforce similar rays from other treatments. If a full epilating dose is administered to point E and to no other portion of the scalp, the hair will fall out over only a very small area. But when similar doses are applied to points A, B and C the oblique rays overlap and complete alopecia is the result. In explanation, it may be stated that point E, being in the field of vertical rays, receives the full epilating dose, while a point half way between E and B receives one-half an epilating dose. But this point also receives one-half an epilating dose when point B is treated. In this way the entire scalp, when the five points have been treated, receives a full epilating dose.

Since the advent of the Holzknecht radiometer, Mackee has had no difficulty in estimating the quantity of ray employed. He has, however, had a great deal of trouble in measuring the quality, and this was entirely due to the impossibility of obtaining tubes that would maintain a constant vacuum during the treatment. Water and air-cooled tubes lessened the difficulty. The air-cooled hydrogen tube, also, has given good satis- has completely overcome all difficulties in faction. But the remarkable Coolidge tube this respect. This tube will maintain a constant vacuum with light or heavy currents for long periods of time and may be used on one case after another throughout the entire day. For the direct estimation of quality he utilizes the Benoist penetrometer, aided by indirect instruments such as the Heinz-Bauer qualimeter, the milliamperemeter, etc.

Mackee employs a "hard ray"; never less than No. 8 of the Benoist scale, and earnestly advises against the use of soft rays. The original epilating dose, as devised by Sabouraud and Noire (B 1 or H 5) was based upon the use of "hard rays," obtained by exciting a tube with a static machine. This fact has been generally overlooked and the use of "soft" rays has been one of the causes of bad results in the past.

He places the pastille on the scalp as advised by Hampson and others, instead of half way between the anode and scalp. There is no doubt in his mind that both accuracy and safety are enhanced by placing the pastille on the scalp. At half distance the slightest movement of the child will alter the relative positions of the head, pastille, and anode, and this will cause a faulty estimation of the dose. With the pastille placed on the scalp, it makes no difference if the head moves a little closer to or a little further from the tube during the exposure. Lateral motion, however, must be avoided in any case. Furthermore, the changes in color are less marked at "skin distance" than at "half distance," and these light brown shades are more easily estimated than are the deeper orange tints. The original dose of 5 H was estimated with the pastille at "half distance," so that when the "skin distance" is employed the color change in the pastille will be four times less than at "half distance." In other words, when the pastille is placed on the scalp the dose must be multiplied by four. Therefore, the epilating dose at "skin distance" will be 1¼ H. As a matter of fact, ¾ H to 1 H will usually suffice, and 1¼ H is the maximum. If this is exceeded, permanent alopecia is likely to result. The maximum dose will produce a complete depilation, but experience has shown that if most of the hair falls out the result will be perfectly satisfactory, so that a dose of 1 H at "skin distance" will usually suffice for all practical purposes. When em-

ploying the "skin distance" the distance between the scalp and anode of the tube is a matter of little moment, so long as it is not too close and the same distance is employed for each of the five exposures. A working distance of 6½ inches has been found satisfactory.

The hair falls out at the end of about three weeks and starts to regrow in about three months. It is essential that no irritating applications be applied to the scalp for two weeks prior to the treatment. As a matter of fact, if chrysarobin, tar, or iodine has been applied, it is better to await the lapse of four weeks. Subsequent to the treatment such chemicals as iodine, tar and chrysarobin are prohibited. It is preferable to allow no application for about a month, at which time a five per cent. ointment of sulphur or ammoniated mercury or some other mild antiparasitic agent may be employed. While the hair is falling the child should wear a linen cap which, with the fallen hair, can be destroyed, so as to protect other children.

Bissell, Frank S., M. D., Minneapolis, Minn.: The Roentgen Rays in the Diagnosis of Focal Infections. (The Journal-Lancet, July 1, 1915, vol. XXXV, No. 13, p. 350.)

Bissell has found dental abscesses in 516 cases. With but two exceptions, there have been symptoms of systemic disease, varying from the mild signs of a low-grade intoxication to those of active inflammation of the meninges, or of one or more of the other serous or mucous membranes of the body. Two patients, who had been confined to their beds for several months with diagnoses of multiple neuritis and "probable meningeal involvement," began to improve, and progressed to recovery after the elimination of several dental foci, which were localized with the Roentgen rays. Another patient was referred for radiographic examination on account of continual, unexplained, unilateral headache. The skull radiographs showed an apparent caries of the temporal bone, while the dental radiographs revealed three unsuspected root-abscesses. The affected teeth were removed, but the skull was not treated, the patient refusing operation; and the symptoms gradually ceased until at the end of two months the patient reported himself cured. The diagnosis of caries was not confirmed, and Bissell has not yet been able to obtain further radiographs of the skull to determine whether any bony changes occurred following treatment. Two cases have developed a frank pneumonia, following extensive extraction, suggesting the probability that their particular strain of organism was the pneumostreptococcus. Bissell has found dental abscesses in so many of these cases that he has come to regard them as "peribronchial streptococcioses," following Dr. H. L. Ulrich's suggestion as to terminology.

The radiographic differences appear to depend upon the manner of invasion, the streptococci being disseminated by the bloodstream, while the tubercle bacilli follow the lymphatics of the bronchial tree. Bissell emphasizes the statement that this is an unestablished hypothesis, still lacking scientific confirmation.

Another striking and frequent coincidence is that of a local pus focus at some point, and symptoms of renal calculus, either with or without the presence of stone.

Thompson, E., Surgeon, and Gall, H. L., Hospital Steward, United States Navy: A Possible New Roentgen Ray Sign of Tuberculosis. (United States Naval Medical Bulletin, July, 1915, vol. IX, No. 3, p. 436.)

For the past year most of the patients who came to the Naval Hospital, Washington, D. C., with a diagnosis of tuberculosis have had various roentgenological examinations made. Plates have been made under various circumstances and fluoroscopic examinations undertaken. The purpose of the work has been to see how far the cases check up with appearances already described, such as the Williams' sign, the changes in the angle of the long diameter of the heart in its relation to the vertical line of the spinal column, etc.

A new condition was observed which may be of some value in the diagnosis of local tubercular foci in the lungs. This condition consists of an irregularity in the rounded outline of the diaphragm line. Under normal conditions the diaphragm is sharply outlined as a smooth line of easy curves. The difference in density of the liver and lungs makes it very easy to observe any break or irregularity in the contour of the line. When viewed with the fluoroscope the diaphragm is seen making its excursions up and down and always preserving its general contour, whatever it may be.

In a great number of cases of pulmonary tuberculosis the plates do not show a smooth outline of the diaphragm. Irregularities are seen and large humps sometimes occur. These elevations are always above the general line of the diaphragm, and are at the expense of the pulmonary side. In other words, it appeared that there might be a place to fill in to equalize the tension, and the diaphragm had bulged up to do it.

In most cases of tuberculosis the sign can be found at some stage of the respiratory cycle.

Pfahler, G. E., M. D., and Stamm, C. J., M. D., Philadelphia, Pa.: Diagnosis of Enteroliths by Means of Roentgen Rays; with Report of Two Cases. (Surgery, Gynecology and Obstetrics, July, 1915, vol. XXI, No. 1, p. 14.)

Enteroliths in the appendix, according to the authors, must be differentiated from:

1. Phleboliths which are so often found in the pelvis. These are round, are most often found in the neighborhood of the spine of the ischium, are generally less dense in the center, have smooth and even surfaces, are often multiple and not infrequently found on both sides. The enterolith would be confusing only when it is small and located deep in the pelvis. Pfahler believes all appendiceal enteroliths are irregular or rough in outline, are less likely to be fixed, and do not occupy the same plane as phleboliths.

2. Calcified glands. These are more likely to occupy a position near the spinal column, and to be located in a deeper plane in the tissues.

3. Genuine enteroliths in the bowel. These are rare, and likely to be larger. They are also less dense, and usually spherical.

4. Gall-stones. These are likely to be less dense, and if located low in the abdomen are likely to be more movable. They also usually show a less dense center.

5. Ureteral stones. These will be the most confusing, because it is usually during a kidney and ureter examination that the appendiceal enteroliths are found. They can be differentiated by passing an opaque catheter into the ureter. They are also likely to be smaller in size and occur in line with the ureter. The ureter is only rarely displaced outward.

6. Foreign bodies, such as are swallowed by children or the feeble-minded. Their shape and density will usually serve to differentiate.

Finally, the enterolith can be definitely differentiated, when suspected, by cleansing the bowel, then giving an opaque enema, filling the bowel and the appendix, and surrounding the enterolith with the opaque mixture.

True enteroliths occupying the bowel are more rare, and, so far as Pfahler can determine, the case reported in this paper is the first to be recognized and definitely diagnosed. It is also the first to be removed without operation.

Enteroliths within the bowel seem to be rare. They reach a considerable size, are globular in shape, are movable, and generally would be only slightly more dense than fecal matter. They must be differentiated from:

1. Movable kidney. In two cases cited this was the supposed diagnosis. A kidney shadow can usually be shown, is not globular in outline, and of course does not occupy the lumen of the bowel, as could be demonstrated by opaque enema, or injection of the colon with air.

2. New growths. These are not likely to be globular, nor movable, and if they occupy the bowel are apt to show characteristic serrations.

3. Gall-stones. Large gall-stones might be most confusing, as is shown in one of my studies. By means of a bismuth meal, or an opaque enema, it is likely, however, that these can be shown to lie outside of the bowel, as was demonstrated in a case of Pfahler's.

It is stated by the authors that enteroliths should be suspected when there is a movable mass in the abdomen, or when opaque bodies are found in the appendiceal region during the course of a Roentgen examination of the ureters.

They can be definitely demonstrated by filling the colon with gas, or, better, by filling it with an opaque enema and demonstrating the mass within the lumen of the bowel.

By means of glycerine enemata and manipulation these enteroliths in the bowel can probably be removed without operation.

BOOK REVIEWS

RADIODIAGNOSTICO Y FISIOTERAPIA TUBERCULOSIS, by Dr. F. Cabrera Benitez, published by Antiga & Company, Havana.

This work is an exposition of the roentgen findings in tuberculous conditions, not only of the lungs, but of the bones and joints, written especially for physicians not specializing in X-ray work. The author justly assumes that in order to properly estimate the value of pulmonary opacities and to interpret the alterations of pulmonary tissue, it is necessary to familiarize one's self with the thoracic shadows normally shown in roentgenography of the chest. The book is written out of the author's own experience in a large tuberculosis clinic. Great credit is due him for the thorough manner in which he has handled the subject. The writer takes the ground that, in young persons, at least one or two out of every five exhibit latent tuberculous lesions in the lung. Considerable importance is placed upon the diminution of the excursion of the diaphragm on the affected side as an early sign of pulmonary tuberculosis. The latter part of the book is taken up with a commendable presentation of the modern treatment of tuberculosis. X-ray treatment is recommended for joint cases, as well as tuberculous adenitis. No mention is made of the X-ray treatment in pulmonary tuberculosis.

There is a paucity of roentgenological literature in Spanish; hence this work will be doubly welcomed by those who live in Spanish-speaking countries.

J. T. C.

PYELOGRAPHY (PYELO-URETEROGRAPHY): A STUDY OF THE NORMAL AND PATHOLOGIC ANATOMY OF THE RENAL PELVIS AND URETER. By William F. Braasch, W. B. Saunders Company, Philadelphia and London, 1915.

In the light of much recent opposition to pyelography by renal surgeons who feared its dangers and doubted its usefulness and the natural skepticism and uncertainty on the part of the profession at large, following these expert opinions, it would seem that the presentation of this careful study by Braasch, with its impartial consideration of the technical difficulties and dangers, as well as the advantages to be derived in this field of work, is most opportune.

This study, by its very nature, divides itself into two fields of interest, namely, that covered by radiography per se, and that occupying purely the domain of urology. But the conjoint nature of the work in these fields would make it seem advisable to consider briefly from both standpoints the important facts brought out in the book.

The signal statement of the author is to the effect that, if the diagnosis can be made complete without pyelography, its use is contra-indicated. It should be used only as an aid in determining the condition present in the doubtful cases, and it is moreover contra-indicated in hypersensitive and frail individuals, who react violently to any manipulation of the urinary tract, or where there is any evidence of renal insufficiency, marked emaciation or acute infection, or in marked hydronephrosis, where the diagnosis is patent from the data gotten through ureteral catheterization. Nor, according to the author, should one ever make a pyelogram under anaesthesia; neither is a bilateral picture advisable at one sitting. With proper choice of cases and infinite care in technique there should be no injurious results, and the author points to his own series of over one thousand pyelograms, without a single mishap, as proof of his contentions.

The ideal medium has not yet been discovered. Silver Iodide emulsion, while less capable of causing injury than other preparations, is far too viscid for use by gravity pressure. Gas is an unsatisfactory medium in that it is difficult, in a given case, to eliminate it from intestinal gas, and it is difficult to keep the renal pelvis so distended as to show minor changes. Theoretically it of-

fers excellent opportunity for study of renal stone, but, practically it cannot be relied upon. In the author's opinion colloidal silver (Collargol) in 10 per cent solution, ground and filtered and slightly warmed before injecting, offers the best results. (At the time of publication there had evidently not been opportunity to study the use of Thorium Nitrate.)

The gravity method is conceded to be the avenue of choice, the fluid being allowed to flow while the plate is being taken to allow for leakage, the pain point being the signal to stop, bearing always in mind that a premature pain point may often be caused by the catheter end sticking into a calyx. One great advantage of the gravity method is that the tube may be lowered, and allowed to drain back, thus avoiding the danger of pelvic necrosis from stasis; another is that there is less danger from over-distension with its possibilities of parenchymal involvement and embolus formation.

The author has fully realized that the correct interpretation of a technically perfect pyelogram requires an extensive knowledge of the normal pelvis and to this end he has devoted much study and space to a consideration of the many variations in contour of the component parts of those pelves which may safely be considered within range of normal. Careful scrutiny of the plates presented in this chapter will quickly convince one of the error of thinking that the interpretation of the pyelogram is a simple task. The chapter is of classic interest in showing the great variety of shadows a normal pelvis may present. Among the many interesting technical points contained, the following is worthy of note: Whenever a uniformly irregular, indented outline is seen in the minor calyces, the pelvis may definitely be called normal and the absence of a chronic pathologic process in the kidney, particularly an inflammatory one, may be inferred. This, of course, connotes the fact, that the pelvis has been properly distended, for an imperfectly distended pelvis would naturally often give a false impression of inflammatory involvement.

It is well to note at this juncture, that the middle calyx is often rudimentary or absent in the otherwise normal kidney; also that both pelves need not be of the same size, and that the apparent anastomoses often seen in the minor calyces are really tricks in the picture, causing an overriding in different planes. Any pelvis lying below the level of the third lumbar vertebra is abnormally placed.

This chapter on normal pelves might well be used as a reference handbook in the X-ray room, and is, in the opinion of the writer, the most valuable single contribution in this study.

Following this thorough groundwork the author considers seriatim the pictures obtained in conditions of Abnormal Position, Mechanical Dilatation, Inflammatory Dilatation; with a special study of Tuberculosis, Stone, Neoplasm, and Congenital Anomalies.

Briefly considered, some of the interesting facts in these chapters are as follows:

Movable kidney even so low as the brim of the bony pelvis unless giving signs of back pressure through marked blunting of the calyces is no warrant for operation. By the same token, even with a fairly large pelvis and no blunting of the popillae one cannot with propriety diagnose nephrosis.

The relative distension of the calyx and the true pelvis varies with the level of the obstruction; if the latter be low in the ureter one finds a general mild dilatation of the ureter and pelvis with marked blunting of the calyces, while if in the upper ureter there is much greater tendency to dilatation of the renal pelvis itself.

In suspected hydronephrosis pyelography is often of great value where there is a stricture which will not allow the catheter to pass far enough to collect enough urine to corroborate the diagnosis, but will allow the ingress of the shadow forming fluid. Obversely, in cases of coiled catheter, with a very rapidly secreting kidney, the pyelogram will often contradict a suspicion of pelvic dilatation.

In tuberculosis, pyelography should be attempted only after cystoscopy, exhaustive urinary study, and animal inoculation have failed. The author advances the following syndrome as diagnostic: (a) Dilatation of the pelvis with moth-eaten outline; (b) Areas of cortical necrosis; (c) Stricture of the ureter. It would, however, seem, at first thought, that a much more intimate knowledge of plate interpretation is necessary to most of us, to make an absolute diagnosis of this disease through pyelography.

Under the general caption of stone, the author suggests the following:

A cortical stone usually lies at the end of a calyx, rarely at its side; usually such a stone will cause dilatation of the calyx next it, through the inflammatory process it sets up.

Hydronephrosis from stone in the pelvis is usually smaller than from constriction of the upper ureter, and in the former there is usually equal dilatation of all the calyces.

Dilatation below a stone means infection and ureteritis. In such cases dilatation is general and not nodular as in ordinary return flow. In differentiating between intra and extra ureteral stone the lack of such dilatation would be practically diagnostic.

In renal neoplasm the chief diagnostic point is retraction of the calyces and blunting of the edges. Often in tumor a twenty-four hour subsequent picture will show smaller islands of shadow, as drainage is usually slow.

Carcinoma tends to necrose and dilates the pelvis instead of encroaching upon it. It is to be remembered that a blood clot in the pelvis may at times simulate tumor.

With small polar tumors there is usually no deformity, but, if a third or more of the gland is involved, demonstrable deformity is usually present.

In differentiating between renal and extra-renal tumor, pyelography may be of aid, for while extra-renal tumor may cause lateral displacement, the pelvis should be normal.

If it is at all evident from other data that tumor is present one should be chary of employing highly concentrated fluid, for in these cases drainage is usually slow, and troublesome irritation may result, especially in weak or emaciated subjects.

The section on anomalies is of dramatic interest, as showing the many possibilities to be kept in mind by the operator.

The writer would beg to again call attention to value of careful study and re-study of the most excellent plates and the comprehensive survey of the subject of normal pelves.

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